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CONTRIBUTIONS  
TO THE  
CRANIOLOGY OF THE PEOPLE OF THE  
EMPIRE OF INDIA.

PART I.  
THE HILL TRIBES OF THE NORTH-EAST FRONTIER AND  
THE PEOPLE OF BURMA.

BY  
PROFESSOR SIR WM. TURNER, M.B., D.C.L., F.R.S.

[WITH THREE PLATES.]

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XXVIII.—*Contributions to the Craniology of the People of the Empire of India.*

Part I. *The Hill Tribes of the North-East Frontier and the People of Burma.* By Professor Sir WM. TURNER, M.B., D.C.L., F.R.S. (With Three Plates.)

(Read July 3, 1899.)

For a number of years I have been collecting specimens and conducting an investigation into the craniological characters of the native inhabitants of our great Indian Empire, and several hundred skulls have now been under examination, and almost all have been measured. The sources to which I have been indebted for material are in part the collection of crania belonging to the Henderson Trustees, long known as the Edinburgh Phrenological Museum, and now deposited by the Trustees in the Anatomical Museum of the University; in part, a few specimens belonging to the University collected by my predecessors in office; in part, the valuable series of Indian crania belonging to the Indian Museum, Calcutta, which through the intercession of Dr JOHN ANDERSON, F.R.S., the former Director, the Trustees of that Museum, with great liberality, most courteously permitted me to have the loan of for purposes of study; and lastly, a number of crania which have been forwarded to me by friends and former pupils, engaged in the public service in India, to whom I take this opportunity of expressing my indebtedness for the valuable material which I have received from them.

Owing to the number of specimens and the wide range of country from which they have been derived, I have thought it advisable to depart from my original intention of including in one memoir my observations on the whole series of crania, and in preference, to arrange and publish them in groups, based on the geographical distribution of the people.

The skulls described in this, the first part of my memoir, are sixty-four in number, and include specimens from the hill tribes of the North-east frontier of India and from Burma. For purposes of comparison I have also given tables of measurements of skulls from China and Siam.

HILL TRIBES.

Before I commence the description of the skulls of the Hillmen, it may be well to preface the anatomical details with some reference to the localities from which the crania were obtained, as well as the names which have been given to the places and to the people who dwell in them.

In entering on the consideration of the savage and barbarous tribes who inhabit the wide range of mountainous country which lies south and east of the river Brahmaputra and Assam on the one hand, and north and west of Burma on the other, we are confronted by differences in the nomenclature employed by those who have explored

this extensive region, and have written descriptions of its inhabitants. Travellers who have approached the hills from the side of India have applied to the places and people such names as the natives of Bengal have been in the habit of using, whilst those who have entered from the Burmese frontier have employed Burmese names to designate the same tribes and localities. As regards the Hillmen themselves, as they usually neither recognise nor pay allegiance to any central authority, they do not apparently possess race or tribal names, but call themselves after the village, or group of villages, in which they live; or after the petty chief who, for the time being exercises authority over them. In some villages no chief appears to be recognised, and the government is a democracy in which all the men are on an equality. The want of a common tribal name is also accentuated by the fact that in adjoining hill ranges the language in use possesses such dialectic differences that the words employed are often mutually unintelligible—a condition which is probably due to the state of constant feud in which the people live, so that they have had but little intercommunication with each other, except as enemies.

The name by which the Hillmen on the north-east frontier first became known to Europeans was that of Kookie, which is a Bengalee word for highlander, and is also written Kuki or Cúcl. As Kookie it appears in a letter addressed in 1777 by the Chief of Chittagong to Warren Hastings.\* In 1778 the Honourable Robert Lindsay, who was Collector at Sythet, speaks of the hill people as Kukis.† He describes them as living more in the style of the brute creation than other savages that he had seen. Their habitations were on spreading trees to defend them from beasts of prey; their food was wild honey and the fruits of the forest. The form Cúcl was used by Mr JOHN RAWLINS‡ in 1790 in his description of the mountaineers of Tipra (Tipperah), to the east of Bengal, and it was also employed by Mr J. RENNEL in 1800 to designate the same people. §

Mr JOHN MACRAE, surgeon at Chittagong, writing in 1801, || states that the Kookies or Lunctas, who live in the mountains north-east of Chittagong, are active mountaineers, but not tall. The face, he says, is like that of eastern Asiatics, broad and round; the nose is flat, the eye small. The men go naked, hence the term Luncta, though the chiefs wear a black loin cloth, and the women an apron. The chiefs bring the hair forward and tie it in a bunch to overshadow the forehead, whilst the other Kookies wear it loose over the shoulders.

• Colonel LEWIN, who acted for many years as Deputy Commissioner in the Chittagong district, and who also accompanied the Lushai Expedition of 1871–72, uses the term Lhoosai or Lushai as equivalent to Kookie, and states that it is derived from “Lu,” signifying head, and “sha,” to cut, from the practice of decapitating their enemies. In

\* Quoted in the *Report on the Hill Tracts of Chittagong*, by Deputy Commissioner T. H. Lewin. Calcutta, 1869.

† *The Thackerays in India*, by Sir W. W. Hunter. London, 1897.

‡ *Asiatic Researches*, 1790, vol. ii. p. 187.

§ Quoted in Deputy Commissioner Lewin's Report, p. 109.

|| *Asiatic Researches*, 1801, vol. vii. p. 183.

one passage he says that these people are named Lankhé by the Burmese.\* He arranges the people occupying these hill tracts, into the Khyoungtha, children of the river, and the Toungtha, or children of the hills. These words, he says, are both Arracanese. The Khyoungtha conform to Buddhist customs, and he considers them to be of pure Arracanese origin. The Toungtha are, he believes, the aboriginal people, and under this name he includes the Tipperah tribes, the Kumi, Mroos, Khyengs, Bungees, Pankhos, Shendoos, and the Lushais or Kookies with their offshoots. In his introductory remarks LEWIN states (p. 33) that the general physique of the hill tribes is strongly Mongolian: broad faces, flat nose with no perceptible bridge; eyes narrow and set obliquely; high cheek bones, no beard or moustache, stature about 5 ft. 6 in. In his special description of the Lushais he says, however, that they differ entirely from the other hill tribes of Burman or Arracanese origin, in that their faces bear no marks of Tartar or Mongolian descent; their complexion is swarthy; the height of the men is about 5 ft. 8 in., that of the women 5 ft. 4 in. In his subsequent book, *The Fly on the Wheel*, written after he had penetrated some distance amongst the Lushai hill tracts, as a member of the military expedition of 1871-72, he repeats the statement that the features did not have the Mongolian type, but were more like Portuguese half-castes. The hair, he says, is black, and fastened in a knot on the nape of the neck.

Colonel WOODTHORPE, R.E., who was also a member of the Lushai expedition of 1871-72, gives an account of the people.† He states that they were of three tribes—Lushais, Paités or Sektés, and Pois. Both sexes were well made and muscular; the average stature of the men was 5 ft. 6 in., that of the women 5 ft. 4 in. The colour of the skin was every shade of brown, but the Pois were fairer than is usual with hillmen. The cheek bones were high and prominent, the face broad, the lips thick, the nose usually *retroussé*, with wide nostrils; though in the higher classes the nose was sometimes thin and aquiline and with small nostrils, and the lips were thin. The eyes were small and almond shaped; the beard and moustache were scanty. The tribes differed in their mode of wearing the hair. The Lushai men part it in the middle, smooth it on each side, bind it in a knot at the nape of the neck, and secure it by a copper or steel pin. The Sekté men do not part it, but wear it short and standing out around the forehead; sometimes the hair is twisted into a tail behind. The Poi men part the hair across the head from ear to ear; that in front of the parting is drawn forwards into a high double knot on the forehead and fastened by a comb; that behind the parting hangs in wavy curls over the back and shoulders. The dress is a long sheet of cotton cloth. The women sometimes dilate the lobe of the ear with a disc of baked clay.

In Mr E. A. GART's Report on the Census of Assam ‡ it is said that the tribes variously

\* See his *Report on the Hill Tribes of Chittagong*, 1869, already quoted, and his book, *A Fly on the Wheel*, London, 1884. Possibly Lankhé is a modified form of the word Lunceta used by Mr John Macrae.

† "The Lushai Expedition," 1871-72, in *United Service Institution Journal*

‡ *Census of Assam*, 1891.



known as Kuki, Lushai, Poi, etc., are closely allied. They are all of the Mongolian type, being a short, squat, muscular people, but effeminate in appearance. Mr BAKER gives in the Report the height of a Kuki measured by him as 4 ft. 11½ in. The return made in the census of Assam, 1891, of the tribes designated as Kukis and Lushais was 60,652 of both sexes.

In 1828 Lieut. T. A. TRANT gave an account\* of the Khyen tribe inhabiting the Yuma Mountains between Ava and Arracan. He states that they differed in several respects from the Burmese: their faces were flatter and not so regular, and the girls tattooed the face. The men wore a black cloth, striped red and white, over the shoulders, a black cloth round the loins, and occasionally a black jacket; the women wore a black petticoat reaching to the knees.

Major G. E. FRYER describes by the name of Khyengst† tribes extensively distributed in the western mountains of Burma from 18° to 21° N. lat. The people who came under his observation belonged to the Sandoway district, Arracan. The Khyengs, he says, regard the Shendoos (Chins), Khumis and Lungkhes (Lunctas) as of the same race as themselves, and the tradition is that they came from the sources of the Kyendweng (Chendwin) river. Major FRYER gives some interesting facts on their physical characteristics. The average height of twenty-five men was 65·2 inches, and their weight was 110 lbs.; the average height of twenty-five women was 57·4 inches, and their weight 94 lbs. The colour of the skin corresponded with No. 28, and that of the eyes with No. 1 of Broca's Tables; the hair was black, though some women had reddish-brown patches on the crown of the head. The faces of the women were tattooed. The heads of a number of men and women were measured, and the mean length in the men is given as 7·5 inches, the mean parietal breadth 5·5 inches; interzygomatic breadth 5·3 inches. The corresponding dimensions in the women were 6·8, 5·0, and 5·2 inches. The length-breadth index of the head, calculated from these data, gave 73·3 for the men, and 73·5 for the women; so that both sexes were distinctly dolichocephalic. As to clothing, the men wear a loin-cloth, passed between the thighs with an end hanging down in front and behind, whilst the women wear a loose blouse reaching to the knee. As regards the practice of wearing the breech-cloth tucked between the legs like a dog's tail, LEWIN states that the Kúmi are called by the Arracanese, Khivé mi, dog-men, though he thinks that the name may also refer to the practice of eating dog for food.

LEWIN, FRYER, and other writers make reference to tribes situated to the east of the Lushai hill-tracts by the name of Shendoos or Shendús. Little that was definite was known about them until the annexation of Upper Burma brought our Government officials into contact with the wild mountain tribes living to the east of the Koladyne river. These tribes were known to the Burmese as Chins. The Chin hill-tracts lie between the Koladyne river and the Chinduri river, and the ranges extend northwards

\* *Asiatic Researches*, vol. xvi. p. 261.

† *Journal Asiatic Soc.*, Bengal, 1875, vol. xliv, part i. p. 39.

beyond latitude 24°. Owing to depredations committed by the Chins it was found necessary to organise an expedition against them in 1889-90.

Surgeon - Lieut. - Col. A. S. REID has published an interesting account of the expedition, along with maps of the Lushai and Chin hill-tracts.\* He regards the Koladyne river as separating the Lushais on the west from the Chins to the east, and he considers that the Burmese word Chin should replace the name Shendú given to these people by those who approached their hills from the Indian frontier.

Whilst exhibiting differences in dialect and dress, Dr REID regards the Lushais and Chins as practically one race. The men, he says, are well built, with strong limbs and good figures. The average height is about 5 ft. 6 in., though individuals approach 6 ft. Like the Lushais, the northern Chins gather the hair in a knot on the nape of the neck, but the tribe of Baungshes wear it on the forehead. The Sektés, again, have it short, and outstanding like the tresses of Medusa. The mode of dressing the hair accords with Colonel WOODTHORPE's description. The Chinmen have a small loin-cloth, and a large shawl or blanket thrown loosely over the shoulders; the clothes of the chiefs are in coloured patterns. A haversack of hairy skin is worn on the right side, suspended by a strap from the left shoulder. The women wear a dark cloth jacket and skirt; the latter is sometimes woven in coloured patterns.

The tribes which inhabit the Kachin Hills on the borders of Upper Burma and Yunnan are often called Kachins or Kakhyens, though a more appropriate name is Chingpaw or Singpho. They have been described both by Dr JOHN ANDERSON† and Mr E. C. S. GEORGE.‡ Their ancestral home was apparently the head waters of the Irrawaddy, and they are probably offshoots of the same race as gave origin to the Chins. The men are said to average 5 ft. 4 in. in height, and the women are three or four inches shorter. The oblique eyes widely separated, high cheek-bones, colour of skin from a brunette almost to black, point to their Mongolian affinities. The nose, however, varies from aquiline to a broad, squat projection on the face. The hair varies between black and brown; the eyes between dark and light brown.

South-east of Assam and north-west of Burma, and in proximity to the state of Manipur, are ranges of hills which lie between 25° and 28° latitude and 93° to 97° longitude. Our knowledge of the tribes inhabiting them is largely due to Captain BUTLER,§ Colonel WOODTHORPE,|| Mr G. H. DAMANT,¶ Dr BROWN,\*\* and General Sir JAMES JOHNSTONE.†† The principal tribes inhabiting these mountains are called Nágás,

\* *Chin-Lushai Land*. Calcutta, 1893.

† *Expedition to Western Yunnan*, Calcutta, 1871.

‡ *Appendix to Census of Burma*, 1892.

§ *Journal Asiatic Soc.*, Bengal, 1875, vol. xliv. part i. p. 307.

|| *Journal Anthropol. Inst.*, 1882, vol. xi. pp. 56, 196.

¶ *Journal Royal Asiatic Soc.*, 1880, vol. xii.

\*\* *Statistical Account of the Native State of Manipur*, 1873.

†† *Experiences in Manipur and the Nágá Hills*. London, 1896.

An excellent account of the social structure, religion, myths, dances and songs, cultivation, trade and war of the Nágás has been compiled by Miss Gertrude M. Godden from the above and other authorities. It is published in the *Journal Anthropological Inst.*, vol. xxvi., Nov. 1896, and vol. xxvii., Nov. 1897.

or naked, from their scanty clothing.\* This name is said by WOODTHORPE to be foreign, and not recognised by the natives themselves. The Nágás are divided into two groups, the kilted Nágás or Angamis, and the non-kilted or Kutcha Nágás. General JOHNSTONE states that Cacharees—people resembling those settled in Cachar—and Kukis are also found in the Nágá Hills. The Kukis came from the south, and are doubtless the same as the Lushais already referred to in the earlier part of this chapter. JOHNSTONE states that they are readily distinguished from the Nágás. The Kuki men are mostly copper-coloured, often with good features; the women are frequently fair, and wear the hair in a long, thick plait down the back.

WOODTHORPE describes the Lhota tribe of the non-kilted Nágás as of square build; eyes small, oblique; face flat; cheek-bones high; complexion dirty sallow; countenance sullen. The hair is cut short or shaved, except a large basin-shaped patch on the crown, where it is two or three inches long and combed down. The tribes living in the hills bordering the Sibsagor district are fair as to colour; the men shave the head except a long tuft from crown to forehead. The tribes in the Jaipur district show every shade of brown in the complexion; the hair is shaved just above the ears, the remainder being drawn back from the forehead and tied behind in a knot, through which strips of horn are passed; some have a small moustache, but few a beard. The Rengmahs wear a wooden tail,  $1\frac{1}{2}$  foot long, attached to the small of the back. The non-kilted Nágás go either quite naked, or the men wear a waist-cloth drawn tightly between the legs, and the women a waist-cloth or short petticoat; some tribes also wear a long bright blue cloth. Tattooing is commonly practised.

The Angamis, or kilted Nágás, are taller than the non-kilted tribes, their average height is from 5 ft. 8 in. to 6 ft. They are also more muscular and more courageous. They have small features; in some cases aquiline, in others flat noses; high cheek-bones; colour in different shades of brown, seldom very dark, and the eastern tribes are fairer than the west; eyes set slightly obliquely. Hair is generally straight, but never frizzly. In youth it is cut short or shaven, except one long tuft from the crown; in adolescence it is about three inches long, brushed down all round, but with the long lock at the back usually worn in a knot bound round with cotton. The lobes of the ears are pierced and decorated. The men wear kilts of cotton cloth, decorated with cowries when on the warpath, and long blue and yellow cloths across the breast and shoulders. \*General JOHNSTONE says that they wear tails of wood, decorated with goats' hair dyed red. The women are tall for the sex, comparatively fair, with a ruddy glow in the cheeks, well-made, and active. They wear a petticoat, and a cloth around the shoulders.

Mr A. W. DAVIS, Deputy Commissioner of the Nágá Hills district, has also given an account of the Angami and some of the other tribes of Nágás in the Report on the

\* These people are not to be confounded with a sect of religious mendicants also called Nágás; or with totemistic sections of several castes in Bengal named after Nág, snake. See Mr H. H. Risley's *The Tribes and Castes of Bengal*, *Ethnographic Glossary*, vol. ii. p. 120, Calcutta, 1891.

Census of Assam, 1891. As many as 102,857 Nágás belonging to different tribes were living in that year in the province of Assam.

The skulls from the Nágá Hills, which Surgeon-Lieut.-Col. WRIGHT has presented me with, belonged to the Tonkal tribe, about seventy miles north-east of Manipur. General JOHNSTONE speaks of visits which he paid to the Tankhool village of Chingsow, to the north-east of Manipur, which is probably of the same tribe as that named Tonkal by Colonel WRIGHT. Both of these authorities speak of Nágá villages in this district as having been raided by Kukis. Sir JAMES JOHNSTONE describes the people as having a fine physique, equal to that of the Angami; but they went mostly naked.

*Lushai Hillmen.* TABLE I.\*

In 1890, my former assistant and pupil, now Surgeon-Captain D. MACBETH MOIR, who was engaged in a military expedition against the Lushais, forwarded to me a skull (H in Table) which was dug up in the process of constructing Fort Tregear, built in the loop made by the Koladyne river in the South Lushai hill-tracts, a few miles to the north of the Blue Mountain. The country visited by the expedition lies between 92° and 94° longitude and 22° and 24° latitude, and consists of a succession of steep hills and deep narrow ravines. Some of the hills attain a height of 9000 feet, and many of the villages are from 4000 to 5000 feet above the sea-level. In the following year Dr MOIR sent me a skull (I in Table) which had been found in the bed of the Koladyne river, immediately to the north of Fort Tregear. He believed it to be the skull of a Lushai who, when returning to a village on the Don Mountain, from a village on the Aitur Mountain, was drowned in crossing the river. The two skulls were found within fifteen miles from each other. Dr MOIR states that the Lushais place the severed heads of their enemies on posts, but do not impale the skull.

In 1891 I received from a former pupil, Surgeon-Captain H. B. MELVILLE, at that time civil surgeon stationed at Fort Aijal in the North Lushai Hills, the skull of a Lushai warrior who had sustained a sword-cut in the left temporal region during a skirmish. The edges of the cut were sharp and somewhat splintered, and the injury had doubtless been the cause of death (G in Table).

Through the kindness of my friend Professor CUNNINGHAM of Trinity College, Dublin, I have had the opportunity of examining two Lushai skulls in his museum. One was procured in 1892 by Dr MALCOLM MOORE. It was dug up in the floor of a hut in Poi Boi, a village of the North Lushai people, situated a little to the north-east of Fort Aijal. The dead are said to be buried in the huts of their relatives. The other specimen was obtained in the village of Ramree in the South Lushai Hills, by Assistant-

\* In this and the succeeding Tables the letters E. U. A. M. mean Edinburgh University Anatomical Museum; H. T. the Museum of the Henderson Trust; T. C. D. the Museum of Trinity College, Dublin. The cubic capacity has been taken by the method which I described in my *Challenger Report* on Human Crania, part xxix., 1884, to which I may also refer for an explanation of the greater number of the measurements employed in the Tables. The terms *chamæproscopic* (low faced) and *leptoproscopic* (high faced) are adopted from Professor Kollmann's memoirs.

Surgeon V. L. WATTS, who was quartered at Fort Lungley, about fifteen miles to the west of Fort Tregear. In digging it up the left side of the face was injured.

The skulls had all reached adult life, but one was aged. Four were presumably men<sup>4</sup> and one a woman. The North Lushai skull, from the Poi Boi village, was metopic.

Three of the crania were elongated and ovoid, though the metopic skull was broader in proportion to the length than the two others. H was somewhat ridged and roof-like in the sagitto-parietal region, whilst the others were more flattened. G and H were dolichocephalic, but the metopic skull was mesaticephalic. In G and in the metopic skull the height was less than the breadth, but in H the reverse was seen. None of the skulls was akrocephalic. In G, immediately behind the coronal suture, a shallow transverse constriction, such as is produced by wearing a head-band during infancy, was seen; this skull was cryptozygous, the two others were phænozygous. In these skulls the glabella and supra-orbital ridges were feeble, and the forehead was almost vertical; the cranial vault was fairly arched in the fronto-parietal region. In H the curve in the parieto-occipital region was gradual, and ended in a remarkably elongated inion, which formed the projecting occipital pole of the cranium. In the other two skulls the parieto-occipital slope was shorter and more abrupt, and the occipital squama projected behind the inion. In these skulls the parietal bones, from the obelion to the lambda, were flattened. The mastoid processes and temporal curved lines were moderate in two skulls, but in H the temporal lines were strongly marked behind, and approached to within 34 mm. of the sagittal suture. Owing to the occipital squama in H being remarkably small both vertically and transversely, it measured only 43 mm. from lambda to inion, and was only 55 mm. wide. As the temporal lines joined the lambdoidal suture only 34 mm. from the inion, three definite areas were marked in this region, viz., a mesial, between the two temporal ridges, and a right and left lateral, extending from the temporal ridge to the mastoid-temporal. The nuchal impressions in the occipital bone were strongly marked.

In these crania, the occipital arc was the shortest, the frontal was the longest in G and H, but in the metopic skull the parietal was much the longest. All three specimens rested behind on the cerebellar part of the occiput. The mean interzygomatic diameter was 127.6.

In all three the bridge of the nose was faintly concave, and the nasal bones projected so slightly that the face was flattened in the nasal region, and in H the nasals were short and narrow. The fronto-nasal suture was not depressed; the nasal spine of the superior maxillæ was moderate, and the incisive surface of the upper jaw was marked off from the floor of the nose by a definite ridge. In the metopic skull the nasal index was leptorhine, in the others mesorhine. In G the upper jaw was slightly prognathic, in H and in the metopic skull, orthognathic; in all, the incisive and canine fossæ were moderate in depth. The orbits, though wider than high, were megaseme in G and in the metopic skull, but mesoseme in H. The palate was much broader than long in these

TABLE I.  
*Chin and Lushai Skulls.*

| CHINS.  |         |       |       |           |       |       | LUSHAIS.                     |                                 |                                   |                                      |                             |
|---|---------|-------|-------|-----------|-------|-------|------------------------------|---------------------------------|-----------------------------------|--------------------------------------|-----------------------------|
| Edinburgh University Anatomical Museum.       |         |       |       |           |       |       | North Lushai Hills, Poi Boi. | North Lushai Hills, Fort Aijal. | South Lushai Hills, Fort Tregear. | South Lushai Hills, Kola-dyne River. | South Lushai Hills, Ramree. |
|   | Jiddim. |       |       | Klungroa. |       |       | Metopic.                     |                                 |                                   |                                      |                             |
|   | A.      | B.    | C.    | D.        | E.    | F.    | T.C.D.                       | E.U.A.M.                        | E.U.A.M.                          | E.U.A.M.                             | T.C.D.                      |
| Collection, . . . . .                         | Ad.     | Ad.   | Ad.   | Ad.       | Ad.   | Ad.   | Ad.                          | Ad.                             | Ad.                               | Ad.                                  | Aged.                       |
| Age, . . . . .                                | M.      | M.    | M.    | M.        | M.    | M.    | M.                           | M.                              | M.                                | M.                                   | F.                          |
| Sex, . . . . .                                | 1270    | 1310  | 1330  | 1290      | 1375  | 1200  | 1405                         | 1390                            | 1480                              | 1330                                 | 1285                        |
| Cubic capacity, . . . . .                     | 174     | 181   | 177   | 173       | 183   | 173   | 176                          | 181                             | 188                               | 169                                  | 170                         |
| Glabello-occipital length, . . . . .          | 131     | 128   | 127   | 136       | 131   | 126   | 132                          | 128                             | 136                               | 132                                  | 127                         |
| Basi-bregmatic height, . . . . .              | 75.3    | 70.7  | 71.8  | 78.6      | 71.6  | 72.8  | 75.0                         | 70.7                            | 72.3                              | 78.1                                 | 74.7                        |
| Vertical Index, . . . . .                     | 95      | 95    | 84    | 85        | 94    | 87    | 90                           | 91                              | 88                                | 91                                   | 90                          |
| Minimum frontal diameter, . . . . .           | 104     | 106   | 108   | 105       | 110   | 107   | 107                          | 116                             | 105                               | 109                                  | 107                         |
| Stephanic diameter, . . . . .                 | 104     | 100   | 105   | 99        | 104   | 105   | 107                          | 103                             | 113                               | 107                                  | 109                         |
| Asterionic " . . . . .                        | 131s.   | 129s. | 137s. | 134p.     | 130s. | 134s. | 136s.                        | 135p.                           | 131s.                             | 136s.                                | 145                         |
| Greatest parieto-squamous breadth, . . . . .  | 75.3    | 71.3  | 77.4  | 77.5      | 71.0  | 77.5  | 77.3                         | 74.6                            | 69.7                              | 80.5                                 | 85.3                        |
| Cephalic Index, . . . . .                     | 490     | 505   | 496   | 480       | 518   | 490   | 506                          | 510                             | 512                               | 490                                  | 504                         |
| Horizontal circumference, . . . . .           | 121     | 122   | 126   | 128       | 137   | 115   | 121                          | 140                             | 135                               | 123                                  | 119                         |
| Frontal longitudinal arc, . . . . .           | 117     | 132   | 114   | 120       | 119   | 105   | 133                          | 129                             | 134                               | 125                                  | 118                         |
| Parietal " " . . . . .                        | 107     | 120   | 123   | 117       | 115   | 122   | 109                          | 114                             | 121                               | 104                                  | 110                         |
| Occipital " " . . . . .                       | 345     | 374   | 363   | 365       | 371   | 342   | 363                          | 383                             | 390                               | 352                                  | 347                         |
| Total " " . . . . .                           | 282     | 281   | 297   | 295       | 286   | 286   | 295                          | 305                             | 300                               | 292                                  | 282                         |
| Vertical transverse arc, . . . . .            | 36      | 31    | 35    | 32        | 31    | 34    | 32                           | 30                              | 35                                | 37                                   | 34                          |
| Length of foramen magnum, . . . . .           | 99      | 98    | 93    | 93        | 98    | 94    | 94                           | 91                              | 106                               | 100                                  | 95                          |
| Basi-nasal length, . . . . .                  | 94      | 91    | 99    | 94        | 96    | 87    | 88                           | 95                              | 103                               | 101                                  | 89                          |
| Basi-alveolar length, . . . . .               | 94.9    | 92.9  | 106.5 | 101.1     | 98.   | 92.6  | 93.6                         | 104.4                           | 97.2                              | 101.                                 | 93.7                        |
| Gnathic Index, . . . . .                      | 139     | 130   | 124   | 119       | 133   | 117   | 127                          | 127                             | 129                               | 132                                  |                             |
| Interrygomatic breadth, . . . . .             | 126     | 121   | 112   | 109       | 124   | 106   | 113                          | 118                             | 120                               | 118                                  |                             |
| Intermalar " " . . . . .                      | 109     | 111   | 110   | 107       | 169   | 105   | 114                          | 118                             | 121                               | 112                                  |                             |
| Nasio-mental length, . . . . .                | 78.4    | 85.3  | 88.7  | 89.9      | 81.9  | 89.7  | 89.7                         | 92.9                            | 93.7                              | 84.8                                 |                             |
| Nasio-mental complete facial Index, . . . . . | 67      | 62    | 64    | 62        | 66    | 63    | 68                           | 69                              | 74                                | 63                                   | 71ap.                       |
| Nasio-alveolar length, . . . . .              | 48.1    | 47.6  | 51.6  | 52.1      | 49.6  | 53.8  | 53.5                         | 54.3                            | 57.3                              | 47.7                                 |                             |
| Maxillary upper facial Index, . . . . .       | 49      | 48    | 46    | 47        | 51    | 45    | 52                           | 50                              | 53                                | 45                                   | 53                          |
| Nasal height, . . . . .                       | 23      | 25    | 25    | 25        | 27    | 24    | 23                           | 26                              | 27                                | 25                                   | 26                          |
| Nasal width, . . . . .                        | 46.9    | 52.1  | 54.3  | 53.2      | 52.9  | 53.3  | 44.2                         | 52.                             | 50.9                              | 55.5                                 | 49.1                        |
| Nasal Index, . . . . .                        | 42      | 41    | 36    | 36        | 40    | 35    | 37                           | 37                              | 40                                | 36                                   | 40                          |
| Orbital width, . . . . .                      | 38      | 32    | 35    | 34        | 37    | 31    | 36                           | 33                              | 34                                | 32                                   | 35                          |
| Orbital height, . . . . .                     | 90.5    | 78.   | 97.2  | 94.4      | 92.5  | 88.6  | 97.3                         | 89.2                            | 85.                               | 88.9                                 | 87.5                        |
| Orbital Index, . . . . .                      | 51      | 48    | 51    | 52        | 52    | 45    | 50                           | 54                              | 55                                | 55                                   |                             |
| Palato-maxillary length, . . . . .            | 64      | 64    | 60    | 57        | 62    | 58    | 63                           | 63                              | 70                                | 65                                   |                             |
| Palato-maxillary breadth, . . . . .           | 125.4   | 133.3 | 117.6 | 109.6     | 119.2 | 128.8 | 126.                         | 116.6                           | 127.2                             | 118.1                                |                             |
| Palato-maxillary Index, . . . . .             | 31      | 31    | 25    | 27        | 30    | 27    | 31                           | 33                              | 32                                | 33                                   |                             |
| Lower jaw. { Symphysial height, . . . . .     | 70      | 63    | 51    | 66        | 58    | 51    | 56                           | 64                              | 60                                | 60                                   |                             |
| { Coronoid " " . . . . .                      | 69      | 68    | 60    | 69        | 61    | 54    | 59                           | 65                              | 62                                | 61                                   |                             |
| { Condylod " " . . . . .                      | 86      | 86    | 84    | 90        | 82    | 80    | 81                           | 88                              | 88                                | 91                                   |                             |
| { Gonio-symphysial length, . . . . .          | 105     | 94    | 88    | 91        | 100   | 88    | 97                           | ...                             | 98                                | 99                                   |                             |
| { Inter-gonial width, . . . . .               | 32      | 36    | 29    | 38        | 31    | 30    | 35                           | 35                              | 36                                | 36                                   |                             |
| { Breadth of ascending ramus, . . . . .       |         |       |       |           |       |       |                              |                                 |                                   |                                      |                             |

skulls, and the index was brachyuranic. The teeth were not decayed; they were not stained, and were partially flattened on the crowns from use. The mean nasio-mental length was 117.7, which is high for that diameter; the mean complete facial index was 92.1, and the mean upper facial index was 55.0; both indices were leptoprosopic, and the face was high in relation to the width. In their cubic capacity all three crania were mesocephalic. Each skull had small Wormian bones in the lambdoidal suture. *G* had a small left epipteric bone, and each orbit showed the rare variety of the superior maxilla, giving rise from its orbital plate to a broad process, which joined the frontal and separated the os planum of the ethmoid from the lachrymal.\* The metopic skull had a large epipteric bone on each side and broad ecto-pterygoid plates.

The Ramree skull and *I*, both of which came from the South Lushai Hills, were in absolute length much shorter than those above described, and as *I* was about equal to and the other much exceeded them in breadth, they were distinctly brachycephalic. The outline in the norma verticalis was not elongated, but was broadly ovoid. The vertex sloped downwards to the parietal eminences, which were prominent. The vertical index was less than the cephalic. Both crania were phænozygous.

The glabella and supra-orbital ridges were scarcely marked; the forehead was nearly vertical and full; the nasal bridge was flattened, and the nasal bones in one were short and narrow, in the other longer and broader. The occipito-parietal slope was steep in *I*, in which this region was not symmetrical and was twisted to the left, probably from artificial pressure in infancy. The occipital arc was the shortest in each skull; in *I* the parietal arc, in the other the frontal arc was somewhat the longer. In the male the interzygomatic diameter was 132 mm.

The upper jaw was moderately projecting, mesognathic in *I*, but orthognathic in the other; the nose was platyrrhine in *I*, mesorrhine in the other; the orbital index was high up in the mesoseme group. The face in *I* was chamæprosopic in both its complete and its maxillary index. In capacity both crania were microcephalic, and the one with the smaller capacity was that of a woman. In *I* a small Wormian bone was in the lambdoidal and another in the left parieto-mastoid suture, whilst the parieto-sphenoid suture was broad. In the other specimen, both parieto-mastoid sutures contained sutural bones, and the right pterion had an epipteric bone. There were no unusual ossifications at the base of the cranium, and the sutures of the vault were comparatively simple.

Two skulls of Lushais, obtained during the expedition of 1871-72, have been catalogued by Dr BARNARD DAVIS in the *Supplement* to his *Thesaurus Craniorum*. In one the length-breadth index was 73, in the other 76; in both the height exceeded the breadth, and the mean interzygomatic diameter was 127 mm. Data are not given for determining the proportions of the height and width of the nose and the degree of projection of the upper jaw. Obviously these skulls had a dolichocephalic character. In

\* Some years ago I described and figured an example of this rare variety in the skull of a Bushman (*Challenger Reports*, part xxix. p. 12, pl. 1, fig. 4, 1884), and I have recently seen it in the skull of a Papuan from New Guinea (*Proc. Roy. Soc. Edin.*, 3rd July 1899).

the tables of anthropological measurements published by Mr H. H. RISLEY,\* seventeen 'Kukis,' natives of Rangamati in the Chittagong Hills, showed in their head measurements a mean cephalic index 76·2, and a mean nasal index 85. In the living person the nose is mesorhine. The customary deduction of two units from the cephalic index in the living head would place the same index in the skull at 74·2, i.e., in the dolichocephalic group. The average stature of the people measured was 5 ft. 1½ in. (1566 mm.).

*Chin Hillmen.* TABLE I.

In 1891 I received from Surgeon-Captain C. L. WILLIAMS a skull which, whilst acting in a surveying expedition, he had picked up in a graveyard within a quarter of a mile of Jiddim, the former capital of the Kankow country.† He states that it is the custom to dry a recent corpse over a fire for some days and afterwards in the sun for many months before it is buried beneath a stone. The skull cannot be that of a captive Burman, as the Kankows impale all captive heads on poles, and the skulls consequently have a large hole in the vertex. The Kankows are a wild tribe living in the mountains north of Burma, reaching almost as far north as lat. 24°, and westwards to the Lushai Hills. Dr WILLIAMS writes that, as compared with the Burmese, the forehead is higher, the nose less sunken, the malar bones less prominent, the lips less thick, and the chin more marked. They are a brave, hardy race of warriors and hunters, with good muscular development.

In 1894 Surgeon-Captain D. H. GRAVES sent me some skulls, which he had collected in the village graveyard at Jiddim, now the chief post for a regiment in the North Chin Hills. Up to three years prior to his visit it had been the largest village of a tribe which he names Nwengal. Dr GRAVES writes that he understands it is the custom when a member of the tribe dies to expose the body to the weather until it is decomposed. The skull is then placed along with others in an earthenware pot, which is buried. Dr GRAVES found two of these pots containing six skulls, four of which he was so good as to send me. In 1893 I also received a woman's skull collected by Surgeon-Captain GRAVES in the village of Klungroa, situated in the South Chin Hills, about sixteen miles to the south-west of Haka, between lat. 22° and 23°. She is said to have been killed by falling into a tiger trap.

The measurements of these skulls are given in Table I. E is the specimen collected by Dr C. L. WILLIAMS, the others are from Surgeon-Captain GRAVES. They were all adult. Five were presumably men, and one, F, a woman.

*Norma Verticalis.*—In this aspect two skulls, viz., B and E, were seen to be elongated and ovoid, so that in their proportions they were distinctly dolichocephalic, whilst A only slightly exceeded the dolichocephalic index. The three others were relatively

\* *Tribes and Castes of Bengal*, vol. i. p. 204, Calcutta, 1891.

† See for an account of the Kankow campaign, *Chin Lushai Land*, by Surgeon-Lieutenant-Colonel Reid, I.M.S., p. 67, Calcutta, 1893. In the large map in this work the name apparently of this village, some miles to the north of Fort White, is printed Tiddim.



wider in the parietal region, and had a somewhat higher length-breadth index, which placed them in the lower term of the mesaticephalic group. In these three, C, D, and F, the parietal tubera projected, so that the outline of the skull approached the pentagonal or coffin shape. There was only a slight tendency to the formation of a sagittal ridge, and the slope outwards from it to the parietal eminences was not steep. One cranium was phænozygous; the rest were cryptozygous.

*Norma Lateralis.*—None of the skulls had a very prominent glabella<sup>a</sup> or supra-orbital ridge, though in A they were more distinct than in the other crania; in A the frontal bone also showed a somewhat shelf-like projection immediately above the external orbital process; in this skull also the forehead was more receding than in the other specimens, in which indeed it approached to the vertical. The vault of the cranium was fairly well arched in the parieto-frontal region, and sloped backwards and downwards in the parieto-occipital region, somewhat more gently in B than in the other specimens. The occipital squama projected behind the inion; there was no appearance of parieto-occipital flattening, though D showed a want of symmetry in that region. The skulls rested behind on the cerebellar part of the occiput. The nasal bones had a concave bridge, and projected so slightly that the face was flattened in the nasal region; the fronto-nasal suture was not depressed. The nasal spine of the superior maxillæ was feeble in some specimens, and in no case strong; a moderate ridge marked the separation of the incisive part of the upper jaw from the floor of the nose. The incisive and canine fossæ were moderate in depth. C and D were more prognathic than the other skulls. As a rule the orbits were high in proportion to their width, but B had a low orbital index. In C, D, and F the nasal index was moderately platyrrhine, in A leptorrhine, in the rest mesorrhine. The teeth had to a large extent been lost, and of those that remained many were worn down and stained. The palate showed no unusual arching. The mastoid processes, temporal and occipital ridges, were moderate. The sutures were not obliterated in any of the crania, though in some, fusion of the bones had begun. Small Wormian bones were present in the lambdoidal suture in three skulls, and in D the suprainial part of the occipital squama had ossified as a distinct inter-parietal bone. All the skulls, with one exception, had an epipterice bone either on the one or on both sides; the parieto-sphenoid suture, when present, was usually narrow. The upper part of the coronal suture and the anterior end of the sagittal suture were almost devoid of denticulations. No skull had an exostosis in the auditory meatus, neither was a third condyle or paramastoid process present. No skull was metopic. The skull D showed a hole in the coronal suture 25 mm. to the right side of the sagittal suture. The hole measured 6 mm. by 4 mm., and the bone around it had a smooth bevelled margin, whilst the surface of the parietal bone behind it was abraded; the appearance led one to think that during life the skull had been injured, probably by the cut of a sword.

The six skulls from the Chin Hills form a homogeneous group, and in their dimensions and relative proportions may appropriately be classed together.

In the glabello-occipital length the crania ranged from a maximum of 183 mm. to a

minimum of 173, and the mean length of the series was 176·8 mm. In their parieto-squamous breadth the maximum was 137 mm., the minimum was 129, and the mean was 132·5 mm. The mean length-breadth index of the group was 75·0. Three skulls had the index either 77·5 or 77·4, which placed them in that division of the mesati-cephalic group which approached closer to the dolichocephalic than the brachycephalic standard. No skull was brachycephalic. Both in numerical proportion and in general shape these Chin crania may be regarded either as distinctly dolichocephalic or as approximating to that group.

In basi-bregmatic height the crania ranged from a maximum 136 mm. to a minimum 126, and the mean was 129·8 mm. The mean length-height (vertical) index was 73·4, so that the skulls belong to the group with a moderate vertical index, which I have named metrioccephalic.\* In D and E the height slightly exceeded the breadth; in A they were equal; in the remaining three the breadth was more than the height.

The mean stephanic diameter, 106·6 mm., exceeded the mean asterionic diameter, 102·8 mm., and the mean minimum frontal diameter was 90 mm. The bizygomatic diameter, with a mean 127 mm., ranged from 117 to 139 mm., and invariably exceeded the intermalar diameter.

The occipital longitudinal arc in four skulls was less than either the frontal or parietal, but in F it was greater than either of these, and in C it was greater than the parietal. In five crania the frontal arc exceeded the parietal, and in B the parietal was the longer of the two.

The nasio-mental length of the entire face ranged from 105 to 111 mm., with a mean of 108·5 mm. The complete facial index ranged from 78·4 to 89·9, and gave a mean of 85·6, so that the skulls fall into the chamæprosopic or low-faced group, not a single specimen was leptoprosopic. As regards the maxillary facial index the range was from 47·6 to 53·8, and the mean was 50·4; they were therefore leptoprosopic in the proportions of the upper face.

In four of the six skulls the basi-nasal diameter exceeded the basi-alveolar. The gnathic index ranged from 92·6 to 106·5, and the mean was 97·6; the majority were orthognathous or mesognathous, though C was prognathous.

The nasal index ranged from 46·9 to 54·3, and the mean of the series was 52·1, *i.e.*, mesorhine; individually, however, A was leptorhine, C, D, and F were platyrrhine, and only two were mesorhine. The orbital index ranged from 78 to 97·2, and the mean was 90·2; the orbits therefore were generally megaseme, B only being microseme. The palato-maxillary index ranged from 109·6 to 133·3, and only one specimen was below 115; the mean was 122·3, which placed the palate well into the brachyuranic group.

The cubic capacity of the cranium in the five men ranged from 1270 to 1375 c.c.; thus there was only a small range of variation amongst them, and the mean, 1315 c.c., was distinctly microcephalic. The capacity of the skull in the specimen which I have regarded as a woman was 1200 c.c.

\* *Challenger Reports*, part xxix. p. 5, 1884.

Although I have described the crania from the Lushai hill-tracts as a group separate from those collected in the hills occupied by the Chins, yet as the peoples known by these names, if not one race, have close affinities with each other, it will be instructive to look at the two series together.

Of the eleven skulls under observation four had a length-breadth index below 75, five were between 75 and 77·5, and two from the South Lushai hill-tracts were above 80; the mean of the series was 76·1. If the two brachycephalic crania are excluded the mean of the rest is 74·6, so that the skulls are in the main dolichocephalic, or approximating thereto in their numerical index as well as in their general form. In three of the skulls the length-height index was slightly above the cephalic, in one they were equal, but the mean vertical index of the series was 73·78; on the whole, therefore, in these skulls the breadth exceeded the height. The mean stephanic diameter was 107·6, whilst the mean minimum frontal breadth was only 90.

If we take the figures suggested by Sir WILLIAM H. FLOWER \* as limiting the three divisions of the gnathic index, two skulls were prognathous, three were mesognathous, the rest orthognathous; and as the mean of the eleven crania was 97·8, orthognathism is apparently a preponderating character.

As the lower jaw was present in ten specimens the complete facial index was obtained. In only one skull was it below 80, in seven between 80 and 90, in two above 90; the mean of the series was 87·5, which places them in the chamæprosopic or low-faced group of Kollmann. The upper facial or maxillary index is on the average 51·5.

The width of the anterior nares was moderate in relation to the height of the nose, the nasal index was leptorhine in only two specimens, in four it was platyrrhine, in the others mesorhine; the mean of the eleven crania was 51·3, *i.e.*, mesorhine; the bridge of the nose was concave and feeble above and tilted forward below, but the face must have been flattened in this region. The height of the orbit was considerable in relation to the breadth, and the mean index was 89·9, *i.e.*, megaseme. The palato-maxillary breadth was great in relation to the length, and the mean index was 122, so that the skulls were in the brachyuranic group; no specimen was dolichuranic.

The mean cubic capacity of the crania of nine men was 1353 c.c., which places them on the confines of the microcephalic and mesocephalic groups.

To summarise the characters of the crania of the natives of the Lushai-Chin hills, one may say that in the main they are dolichocephalic: as a rule the breadth of the cranium exceeds the height; the upper jaw is orthognathic; the face is low, chamæprosopic; the nasal width is moderate in relation to the height, mesorhine; the height of the orbit approximates to the breadth, and the index is megaseme; the palato-maxillary breadth is wide in relation to the length, brachyuranic; and the cranial capacity is moderate.

\* *Catalogue of the Museum of the Royal College of Surgeons*, p. 252. 1879.

*Tonkal Nágás.* TABLE II.

In 1893 a box reached me from Surgeon-Lieutenant-Colonel F. W. WRIGHT, D.S.O., containing eight skulls which he had collected in the house of a Tonkal Nágá, in the upper village of Hwining, situated about 6000 feet above the sea-level in the hills some forty miles north-east of Manipur. The occasion which led to an expedition being sent into the hills was a raid by the "Kukis" on the Nágá village of Swemi, situated some 7000 feet above sea-level, and about 70 miles north-east of Manipur. The people of Hwining, although themselves Nágás, had joined the Kukis in the raid on villages of their own tribe.

Dr WRIGHT also wrote a most interesting letter, in which he informed me that there are two villages at Hwining, an upper and a lower, built on the crest of a spur running from about south-west to north-east, and at the south-west end is the upper village. The villages are separated by about half a mile of uneven ground, and their inhabitants used to fight with each other, and take each other's heads. As it is not the custom of the Tonkal Nágás to preserve the heads of friends and relatives, but to bury their dead close to their houses, the skulls collected had evidently been those of persons murdered or killed in battle, and afterwards preserved. Dr WRIGHT found these skulls fixed as trophies to a board on the wall of the front room facing the entrance to a house. He believes them to be the skulls of Tonkal Nágás, as Hwining is surrounded by Tonkal villages, with which it was, and indeed in some instances is, still at feud; possibly they are skulls of the Nágás of the lower village of Hwining. The head of a woman is as much prized as that of a man, for as women do not go far away from their homes, the captor requires to approach close to the hostile village, and puts himself therefore into greater danger in order to secure the head.

From the very instructive account of the Nágás with which Dr WRIGHT has favoured me I make the following extract:—

"The hills north-east of Manipur range in height from 3000 to 7000 feet. They are clothed with forests, and abound in game. The human inhabitants are Nágás and Kukis. Both are savage tribes, and go about nearly naked, but the women are more clothed than the men. They make clearings in the forests and grow crops of rice, Indian corn, etc., and from the rice they make a fermented liquor called 'Zoo,' which is not unlike a rough kind of cider. The Nágás are the indigenous natives, and reside permanently in one place, and live in huts on the tops of the hills, where they can command a view of the approach of their enemies. The Kukis have immigrated from the south from the hills between Manipur and Burma. They are not settled in their habits, but make from time to time new clearings, so that they are very destructive to the forests, and raid the Nágá villages and kill the inhabitants. Both Nágás and Kukis eat the flesh of pigs and other animals. It is said that a Nágá gives a good meal of rice to a dog, then kills and roasts it, and makes a meal of dog, stomach and rice.

Neither Nágás nor Kukis drink milk, which they look upon as an excrement.\* Their native weapons are bows, spears and poisoned arrows; the poison is said to be aconite. They are now using guns, and employ urine and fæces in the manufacture of gunpowder. They are demon worshippers. They seem to have slaves, and in both the Nágá and Kuki villages there are head-men or village elders, though in theory all the men are equal. Both Nágás and Kukis make very good coolies, but the Nágá is preferred, as he is both cheerful and enduring."

"In the Nágá houses the wall of the front room facing the entrance is decorated with the heads and bones of the animals killed for food and in the chase. Heads or horns of the Sambre deer, mithan buffalo, pig, barking deer, bear, dog, porcupine, and capricorn were recognised. Outside the entrance of the house of a head-man a small grove of dead trees is sometimes seen. Each tree signifies a big feast, the trees being set up as monuments of the head-man's hospitality. They are also used incidentally for the growth of orchids. The Kukis do not set up monuments of dead trees, but they fix trophies of the skulls and horns of animals at the entrance to their houses.† A Kuki warrior therefore can point to the human skulls in his house as evidence of his cunning and bravery as a head hunter, and to the crania of the large mammals as testifying to his success in the chase and to his hospitality."

"The Nágás shave the head, but leave a crest of hair in the middle of the crown from front to back, which ends in a lock hanging down behind. The Kukis do not shave the head. Neither they nor the Nágás have hair on the face. The Tonkal Nágás wear a ring made of bone, or ivory, or porcelain, around the middle of the penis, and it appears to be a mark of bad manners to appear without the ring."

When the expedition occupied the Kuki village of Mougham some recent scalps were noticed on a tree near the chief's house in the highest part of the village. On examining them more closely they were seen to consist not only of the scalp but of part of the skull, the top of which had been cut off and the bone pierced with a spear. They were trophies of the raid on the Nágá village of Swemi. The Political Agent told Dr WRIGHT that in the Nágá villages the young men sleep together in a house of their own, but he is not sure if a similar arrangement is provided for the young women, though he thinks that it is so.‡

The skulls of the Tonkal Nágás were all from adults, though one was aged, and in two specimens the upper wisdoms were not erupted. Six were without

\* Miss Mary H. Kingsley (*Travels in West Africa*, p. 451, London, 1897) states that the West Coast Africans have a horror of the idea of drinking milk, and hold it as a filthy habit.

† In some of the Pacific Islands, as in the Solomon group, human skulls and those of pigs, dogs, and dugongs are preserved in and around the Tambu house, and the practice of preserving and decorating the skulls of relatives and enemies alongside of the skulls of animals prevails extensively in New Guinea.

‡ The custom of providing a separate sleeping house in each village for all the unmarried girls and another for all the young men prevails generally amongst the races to the north-east and south of Assam (S. E. Peal in *Journal Asiatic Soc.*, Bengal, vol. lli. part ii., 1883). A similar practice also exists amongst the Khonds, a hill tribe in the Indian peninsula (R. W. Frazer, *Silent Gods and Sun-Steeped Lands*, London, 1895). It is also the custom with some of the tribes in New Guinea and other islands in Polynesia.

doubt those of men, one a woman, and one was more doubtful, though most probably a man.

Each of these skulls was enclosed in an open basket-work frame of split cane. In the greater number two parallel bands of cane were bent antero-posteriorly and mesially around the base of the skull to the occiput, vertex, forehead and face, including the lower jaw. These longitudinal bands were intersected and knotted to a band which passed around the skull in its vertical transverse circumference. A vertical transverse band of cane had been passed below the angles of the lower jaw and was secured to the zygomata. A decorative feature in each orbit consisted of a strip of cane rolled once or twice around the interior of the chamber near the facial orifice; so as, when seen at a short distance, to simulate an eye. The skulls had been dried with the scalp on, but the hair had been removed. In three specimens the base of the skull had been partially broken away, doubtless to assist in the extraction of the brain, so that the determination of the capacity of these crania was only approximative. The heads had been exposed to smoke, and were more or less blackened. The scalp and the basket-work had to be removed in order to examine the crania and take the measurements; but the basket-work was subsequently replaced.

*Norma Verticalis.*—From this aspect the series of skulls did not present a uniform appearance. The woman's and four men's, D, E, F, G, were elongated and more or less ovoid, with vertical sides and a tendency to a sagittal ridge, from which the skull sloped rapidly downwards and outwards to the parietal eminences; in E, F, and H the crania had an "ill-filled" character. In the other three male skulls, A, B, C, the breadth was proportionately greater in relation to the length, so that the form was not so elongated an ovoid as in the other specimens; the vertex also had not the same tendency to be ridged, and the slope outwards to the parietal eminences was not so steep. One skull was phænozygous, but in the majority the zygomata were concealed in the vertex view; the condition in G could not be ascertained, owing to the zygomata being broken, but from the wide stephanic diameter it would probably have been cryptozygous.

*Norma Lateralis.*—In none of the skulls were the glabella and supra-orbital ridges very prominent, and they were best marked in the skull A, which was metopic. The forehead was almost vertical; the arch of the vault was moderate, and the slope backwards into the occipital region was as a rule gentle, and in A, B, and C, that is, in the more brachycephalic crania, the occipital squama projected in all behind the inion; there was no sign of parieto-occipital flattening. As a rule the skull rested behind on the cerebellar part of the occiput, and in five of the skulls the parietal arc was somewhat longer than the frontal. In all, the occipital arc was less than the frontal, and in only one specimen did it exceed the parietal. The face was flattened in the nasal region, and the osseous bridge of the nose was slightly concave and not projecting. The nasal bones were relatively narrow, the fronto-nasal suture was not depressed. The nasal spine of the superior maxillæ was faint; a fairly-defined ridge demarcated the incisive

TABLE II.

*Tonkal Nágás, Hwining. Nepal.*

EDINBURGH UNIVERSITY ANATOMICAL MUSEUM.

|  | Metoplc. |      |        |         |         |       |         |        | Par-<br>butia.<br>Gurung.<br>Nepal. |
|--|----------|------|--------|---------|---------|-------|---------|--------|-------------------------------------|
| Collection, . . . . .                            | A.       | B.   | C.     | D.      | E.      | F.    | G.      | H.     | Ad.                                 |
| Age, . . . . .                                   | Ad.      | Ad.  | Ad.    | Ad.     | Ad.     | Ad.   | Ad.     | Ad.    | Ad.                                 |
| Sex, . . . . .                                   | M.       | M.   | M.     | M.      | M.      | M.    | M.      | F.     | M.                                  |
| Cubic capacity, . . . . .                        | 1565     | 1455 | 1520   | 1520ap. | 1395ap. | 1455  | 1600ap. | 1250   | 1655                                |
| Glabello-occipital length, . . . . .             | 188      | 171  | 177    | 182     | 180     | 183   | 186     | 174    | 168                                 |
| Basi-bregmatic height, . . . . .                 | 137      | 136  | 136    | ...     | ...     | 137   | 138     | 132ap. | 144                                 |
| Vertical Index, . . . . .                        | 72.9     | 79.5 | 76.8   | ...     | ...     | 74.9  | 74.2    | 75.9   | 85.7                                |
| Minimum frontal diameter, . . . . .              | 103      | 93   | 98     | 97      | 88      | 97    | 97      | 85     | 97                                  |
| Stephanic diameter, . . . . .                    | 111      | 111  | 109    | 110     | 110     | 107   | 120     | 102    | 121                                 |
| Asterionic, . . . . .                            | 110      | 97   | 109    | 107     | 115     | 106   | 120     | 108    | 109                                 |
| Greatest parieto-squamous<br>breadth, . . . . .  | 145      | 140  | 145    | 132     | 135     | 134   | 140     | 130    | 152s.                               |
| Cephalic Index, . . . . .                        | 77.1     | 81.9 | 81.9   | 72.5    | 75.     | 73.2  | 75.3    | 74.7   | 90.5                                |
| Horizontal circumference, . . . . .              | 535      | 500  | 516    | 510     | 505     | 514   | 528     | 488    | 507                                 |
| Frontal longitudinal arc, . . . . .              | 134      | 120  | 125    | 122     | 134     | 133   | 134     | 120    | 137                                 |
| Parietal, . . . . .                              | 120      | 130  | 128    | 127     | 133     | 131   | 138     | 121    | 128                                 |
| Occipital, . . . . .                             | 125      | 110  | 109    | 121     | 115     | 116   | ...     | ...    | 108                                 |
| Total, . . . . .                                 | 379      | 360  | 362    | 370     | 382     | 380   | ...     | ...    | 373                                 |
| Vertical transverse arc, . . . . .               | 302      | 308  | 301    | 301     | 302     | 298   | 306     | 291    | 325                                 |
| Length of foramen magnum, . . . . .              | 35       | 37   | 37     | ...     | ...     | 32    | ...     | ...    | 36                                  |
| Basi-nasal length, . . . . .                     | 106      | 96   | 101    | ...     | ...     | 102   | 100     | ...    | 97                                  |
| Basi-alveolar length, . . . . .                  | 99       | 93   | 87     | ...     | ...     | 100   | 93      | ...    | 90                                  |
| Gnathic Index, . . . . .                         | 93.4     | 96.9 | 86.1   | ...     | ...     | 98.   | 93.     | ...    | 92.8                                |
| Interzygomatic breadth, . . . . .                | 146      | 131  | 137    | ...     | 127     | 140   | 131     | 122    | 141                                 |
| Intermalar, . . . . .                            | 132      | 121  | 123    | 120ap.  | 116     | 124   | 114     | 115    | 122                                 |
| Nasio-mental length, . . . . .                   | 119      | 118  | 114ap. | 107     | 115     | 117   | 111     | 115    |                                     |
| Nasio-mental complete facial<br>Index, . . . . . | 81.5     | 90.  | 83.1   | ...     | 90.5    | 83.5  | 84.7    | 94.2   |                                     |
| Nasio-alveolar length, . . . . .                 | 71       | 72   | 72     | 67      | 67      | 70    | 66      | 68     | 46                                  |
| Maxillary upper facial Index, . . . . .          | 48.6     | 54.9 | 52.5   | ...     | 52.7    | 50.   | 50.3    | 55.7   | 46.8                                |
| Nasal height, . . . . .                          | 53       | 53   | 57     | 58      | 50      | 54    | 50      | 50     | 51                                  |
| Nasal width, . . . . .                           | 28       | 26   | 25     | 27      | 26      | 29    | 26      | 24     | 21                                  |
| Nasal Index, . . . . .                           | 52.8     | 49.1 | 43.8   | 46.5    | 52.     | 53.7  | 52.     | 48.    | 41.2                                |
| Orbital width, . . . . .                         | 42       | 37   | 42     | 40      | 36      | 37    | 38      | 33     | 39                                  |
| Orbital height, . . . . .                        | 36       | 35   | 38     | 37      | 35      | 34    | 36      | 30     | 36                                  |
| Orbital Index, . . . . .                         | 85.7     | 94.6 | 90.5   | 92.5    | 97.2    | 91.9  | 94.7    | 90.9   | 92.3                                |
| Palato-maxillary length, . . . . .               | 51       | 55   | 46ap.  | 52      | 48      | 56    | 46      | 52     | 51                                  |
| Palato-maxillary breadth, . . . . .              | 67       | 66   | 59ap.  | 63      | 65      | 67    | 66      | 69     | 68                                  |
| Palato-maxillary Index, . . . . .                | 131.3    | 120. | 128.2  | 122.1   | 135.4   | 119.6 | 143.4   | 132.6  | 133.3                               |
| Lower jaw. { Symphysial height, . . . . .        | 28       | 28   | 33     | 30      | 30      | 31    | 28      | 32     |                                     |
| Coronoid, . . . . .                              | 62       | 66   | 67     | 57      | 60      | 61    | 57ap.   | 56     |                                     |
| Condylod, . . . . .                              | 64       | 68   | 65     | 65      | 58      | 64    | 59      | 58     |                                     |
| Gonio-symphysial length, . . . . .               | 84       | 74   | 89     | 88      | 92      | 92    | 82      | 88     |                                     |
| Inter-gonial width, . . . . .                    | 97       | 90   | 105    | ...     | 107     | 102   | ...     | 100    |                                     |
| Breadth of ascending<br>ramus, . . . . .         | 36       | 36   | 35     | 36      | 40      | 36    | 30      | 33     |                                     |

part of the upper jaw from the floor of the nose; the canine and incisor fossæ were moderate in depth, though in the aged skull they were deeper. The jaws were not prognathic; the orbits were high in proportion to their width. The teeth were deeply stained, and as a rule free from decay, though in the older skulls they showed evidence of wear, and in the aged specimen they had almost all been shed and the sockets absorbed. The sutures in the aged skull were almost obliterated, and in some of the other crania they were also disappearing. The mastoid processes were moderate, the temporal and occipital ridges were fairly marked. The palate was arched and horseshoe shaped. The external meatus was free from exostoses. No third condyle or paramastoid process was seen, but in one specimen each, external pterygoid plate sent a spur-like process backwards which did not reach the spine of the sphenoid. In one skull the infra-orbital suture was seen.

In three specimens small Wormian bones were in the lambdoidal suture. The breadth of the parieto-sphenoid suture varied from 3 to 12 mm. In the right pterion of two specimens, F and G, an epipteric bone was seen, and in the left pterion of both of these skulls a tongue-shaped process of the squamous temporal articulated with the frontal; in the skull F this process was so broad as to separate the ali-sphenoid from the parietal by an interval of 17 mm.

The eight skulls of the Tonkal Nágás varied in maximum length from 171 to 188 mm., with a mean of 180 mm. In their greatest breadth the range was from 130 in the woman to 145 mm. in the broadest-headed man, and the mean was 137.6. The mean cephalic index of the series was 76.4, i.e., mesaticephalic; two of the crania were brachycephalic, four were dolichocephalic, and the remaining two were in the lower half of the mesaticephalic group.

The crania ranged in basi-bregmatic height from 132 to 138 mm., with the mean 136 mm., and the mean vertical index was 75.7, which is moderately high. In two specimens the vertical index was slightly above the cephalic, but the opposite condition was the rule.

The mean stephanic diameter, 110 mm., slightly exceeded the mean asterionic, 109 mm., and both were considerably higher than the mean minimum frontal diameter 94.7 mm. The bizygomatic diameter, with a mean of 133.4 mm., ranged from 122 to 146 mm. In each skull it invariably exceeded the intermalar diameter.

The mean complete facial index was 86.7, i.e., chamaeprosopic, whilst the proportions of the upper face gave an index 52, or leptoprosopic. In the five skulls in which the dimensions could be taken the basi-nasal diameter exceeded the basi-alveolar, and the mean relative index, 93.5, was orthognathous.

In the nasal index two skulls were leptorhine, five were mesorhine, and only one was platyrhine; the mean index of the series was 49.7, or mesorhine. The mean orbital index was 92.2; the orbit, except in one skull, was megaseme, and with no great difference between the breadth and height. The mean palato-maxillary index was 128.9, and every skull was brachyuranic.



The seven male skulls had a mean internal capacity 1501 c.c., whilst the single woman's skull was only 1250 c.c.

Up to this time very few examples of the skulls of the natives of the Nágá Hills have been deposited in Museums. The specimens sent home by Surgeon-Lieutenant-Colonel WRIGHT form therefore an important addition to the material collected for the investigation of their cranial characters. In the Barnard Davis collection, now in the Museum of the Royal College of Surgeons of England, are three Nágá crania; \* and a fourth specimen from Ninu, in the Patkoi Mountains, has subsequently been acquired by the College. These, together with a fifth specimen, collected by Colonel WOODTHORPE in the Patkoi Mountains, have been described by Professor G. D. THANE,† who looks upon three as those of men and two those of women. They are all adult, but not aged. Two were decorated: one with wire passed through the orbits and zygomata, which supported fragments of shell as well as some small bells; the other having rings of thick wire placed through the zygomatic arches, orbits and nasal cavities.

Both in Professor THANE's series and in mine the skulls had a certain smoothness of surface, owing to the muscular ridges and processes possessing no special prominence, and the forehead was almost vertical. His specimens were, however, shorter than mine, for though the mean height and breadth were almost identical in the two series, the mean length of THANE's specimens was 4 mm. less than in mine. In both sets the mean cephalic index was mesaticephalic; but in THANE's series owing to the diminished length it was 78.1, being 1.7 higher than in mine; taking both series together the mean cephalic index in the thirteen Nágá skulls was 77. The mean vertical index in THANE's specimens was 78.4, which was appreciably higher than in mine, and the mean of both series was 76.9, so that the mean breadth very slightly exceeded the mean height in the two groups. The crania may be regarded as hypsicephalic.

In Professor THANE's series the mean gnathic index was 98.6, but in mine it was much lower, 93.5: the mean of both series was 96, i.e., orthognathous. In his specimens the mean nasal index was 53.3, in mine 49.7, but the mean of the two was 51.1, i.e., mesorhine: the anterior nares therefore are moderately wide in relation to the height. In his crania the mean orbital index was 88.5, in the higher term of the mesoseme series; but in mine they were definitely megaseme, so that in the people generally we may say that the height of the orbit approaches its width. In both series of skulls the palate was wide in relation to its length, and the index was brachyuranic.

In THANE's specimens the mean interzygomatic diameter was 129.7, but in mine it was 133.4, and as five of my skulls exceeded in this dimension the mean of his collection, it follows that they had greater breadth in the facio-zygomatic region.

The three male skulls in Professor THANE's series ranged in their cubic capacity from 1300 to 1400 c.c., with a mean of 1377 c.c., whilst the mean capacity of the two women was 1237 c.c. In my series, only one skull apparently was that of a woman

\* *Thesaurus Craniorum*, p. 173; and *Supplement*, p. 88.

† *Journal of the Anthropological Institute*, vol. xi, p. 215, 1882.

with a capacity of 1250 c.c., whilst the mean of the seven men was 1501 c.c., which is much above the average of savage or barbarous people, corresponding indeed to the European mean. If THANE's males are, however, computed along with my series of males, the mean capacity is reduced to 1464 c.c., a measurement which is also high for a tribe of savages.

In the preceding narrative it will have been noticed that explorers in the hill ranges occupied by the Lushais (Kukis) and Nágás have recognised differences in the physical characters of these people. Sir JAMES JOHNSTONE, for example, definitely states that they are readily distinguishable from each other. There is, however, a general consensus that their narrow oblique eyes, flat broad faces, high cheek bones, flat noses, skin of various shades of brown, inclining sometimes to copper colour, long straight black hair, and scanty beard and moustache, are Mongolian characters. Colonel LEWIN, however, in both his works asserts that the Lushais do not exhibit the Mongolian type of feature, and he compares them with Portuguese half-castes. WOODTHORPE speaks of some of the Angami Nágás as having aquiline features and a complexion so fair that the cheeks show a ruddy glow.

It would seem, therefore, whilst the Mongolian type of feature prevails, that departures from that type do occur with sufficient frequency to be noticeable. The study of the skulls proves that they also possess some diversities of character. Though the majority of specimens in the Chin-Lushai group and in the Nágás were dolichocephalic or approximated thereto, in both the Lushais and Nagas two distinctly brachycephalic crania were met with, though in the series of Chins 77.5 was the highest index of breadth. Both groups, however, were alike in the absence of a marked projection of the upper jaw: in both, the face was wide in relation to its height, and the complete index was chamæprosopic; the nose was not prominent, and the mean nasal index in both groups was mesorhine and the orbital index was megaseme. Their facial characters were therefore closely allied, and testify to a corresponding physiognomy. As regards the breadth of the face, the mean interzygomatic diameter of ten Lushai-Chin skulls was 127.7 mm., and that of seven Nágás was 133 mm., as compared with 130.6, the mean of the same diameter in thirteen Chinese crania in the collection, and 131.5, the mean of four Siamese skulls. The Nágás, therefore, in absolute width of face surpassed the Chinese and Siamese which I have measured. In the Nágás the mean capacity of the crania was distinctly higher than in the Chin-Lushai series.

As the best marked Mongolian races are either definitely brachycephalic or in the higher terms of the mesaticephalic group, it is interesting to note that these hill tribes, with a prevailing type of Mongolian feature, possessed crania in which brachycephalism is the exception, and where the customary form of skull is dolichocephalic or approximating thereto. It would seem, therefore, that the Mongolian character of face is not necessarily associated with only one type of cranium.

*Nepal.* TABLE II.

More than thirty years ago the late Sir JOHN BROWN, of the Indian Medical Service, presented to the Anatomical Museum of the University, a skull without the lower jaw, which he had found in the valley of Nepal. He believed it to be that of a Gurung or Magar, and it is marked, apparently in his own handwriting, Parbuttia, which signifies hillman. Surgeon-Lieut.-Colonel REID states\* that the Gurungs and Magars occupy the country to the west of the Nepal valley. They are, he says, short and powerful men of Mongolian cast of features, with broad flat faces and oblique eyes. They form the Gurkha regiments in the British army in India.

The skull is obviously that of a man not thirty years of age, for the upper wisdom teeth were not erupted. The sutures were unossified and comparatively simple. The squamous-temporals were small, but the ali-sphenoids were wide, and each had a broad articulation with the parietal at the pterion. The mastoids and the temporal and occipital ridges were feeble, and there were no unusual ossifications.

In the *norma verticalis* the breadth of the cranium approximated to the length. The parieto-occipital region was almost vertical, flattened and unsymmetrical, the flattened surface being directed to the right. Sir JOHN BROWN ascribed the shape of the skull behind to the mother, as she carried her infant, having kept this aspect of the head pressed against some part of her person. The vertex was not ridge-like, the parietal and frontal eminences were distinct, the parieto-squamous region bulged laterally. The length-breadth index was 90.5, and the skull was hyper-brachycephalic. The height was materially less than the breadth, notwithstanding that the basi-bregmatic diameter was as high as 144 mm. The skull was cryptozygous.

In the *norma lateralis* the glabella and supra-orbital ridges were seen to be feeble, the forehead was lofty and not very receding. The frontal longitudinal arc was much the longest and the occipital the shortest. The bridge of the nose was almost straight, sharp, and moderately projecting, and there was scarcely any fronto-nasal depression. The nasal spine of the superior maxillæ was distinct, and a sharp ridge separated the floor of the nose from the incisive region. The nasal index was markedly leptorhine. The interzygomatic diameter was 141 mm., so that the face was unusually wide. The orbital index was strongly megaseme. The upper jaw was not prognathic. The palate was not highly arched, and as its breadth materially exceeded the length it was highly brachyuranic. The internal capacity was 1655 c.c. and the skull was megacephalic. In its brachycephalic form and proportions, in the breadth being less than the height, the flattened nasal region, the broad face, the slight forward projection of the upper jaw, megaseme orbit, and brachyuranic palate, the cranium exhibited well defined Mongolian characters.

Sir R. OWEN has given the measurement of a skull of an adult male Gurung† in

\* *Chin-Lushai Land*, p. 72. 1893.

† Owen, *Rep. Brit. Assoc.*, 1859, p. 100.

the British Museum, the length of which was 7 inches and the breadth 5 in. 8 lines: the length-breadth index may be regarded as 81·4. Other crania from Nepal had different proportions. From the measurements which he has recorded of two Magar skulls it is probable that in this race the crania are dolichocephalic. A skull from Nepal, figured by MM. DE QUATREFAGES and HAMY,\* plate lxii., is elongated in form, and with a length-breadth index 75·5. Dr BARNARD DAVIS catalogues, *Thesaurus Craniorum*, p. 158, seven crania from Nepal, which he names Khas. The length-breadth index varied in them from 73 to 78, and gave a mean 75·7. The skulls were either dolichocephalic or mesaticephalic. In the anthropological tables compiled by Mr H. H. RISLEY† the mean cephalic index in 28 living Gurungs is stated to be 81·6, and the nasal index in the same persons was 78·5. The heads were brachycephalic, and the nose was mesorhine. The average stature was 5 ft. 2½ in. (159·8 mm.). It would appear, therefore, that the people of Nepal are not a homogeneous race. A strong Mongolian element, however, exists in that country, as is shown both in the skulls and heads of the Gurungs which have been measured.

#### BURMA.

The inhabitants of Burma consist in the main of the people termed Burmese, but intermingled with them are representatives, sometimes in considerable numbers, of other tribes and races. The Burmese proper are in all probability of the same stock as the Himalaya-Tibetan people, offshoots of which race migrated, it is believed, in a south-easterly direction until they reached Burma. How far the country was populated by aborigines, prior to and at the time of the invasion, it is impossible to say. It is, however, thought that the district forming the delta of the Irrawaddy was occupied by a people named Mōns or Talaings, whose descendants remain more or less commingled with the Tibeto-Burmese stock. The Burmese proper, according to the census return for 1891, were 9,000,000, whilst the Talaings were not quite 1,000,000 in number.‡

Partly on the confines of and partly within the Burmese territory are other races, which in their respective districts modify the population. To the east are the Shan states; to the northward are Manipur and the Nágá hills; to the north-west the Lushai-Chin hill ranges, the people of which were described in an earlier chapter of this memoir; and to the east of Lower Burma are the Karens, who constitute an important element in the population.

The Shans, according to the census returns for 1891, were about 180,000 in number in Upper Burma, and about 108,000 in Lower Burma. The Chins, under which term the census report includes apparently also the Kukis (Lushais) and Nágás, were 206,000.

\* *Crania Ethnica*, p. 416.

† *Tribes and Castes of Bengal*, Calcutta, vol. i, pp. 232 and 220. 1891.

‡ The above figures are compiled from the Census of 1891, *Report on Burma*, prepared by Mr H. L. Eales, the Provincial Superintendent, Rangoon, 1892.

The Karens numbered about 1,000,000. In addition to these races, natives of India, Malays, Chinese and Europeans were also represented.

The Burmese proper are people of moderate stature. In the lists which accompanied the valuable series of crania of prisoners who had died in the jail at Insein, for which I am indebted to Surgeon-Major BELL, the stature of each person is given in feet and inches. They were all men. The mean stature was 5 ft. 2½ in. The tallest man, Nga Aung Myat, a native of Yebouk, was 5 ft. 7 in., and the shortest, Nga Pe, a native of Sharsayboo, was 4 ft. 9½ in.; whilst another, Nga Pu, born at Aungmyingain, was 4 ft. 11 in. Seven measured from 5 ft. 5 in. to 5 ft. 6 in., and the others were between 5 ft. and 5 ft. 4 in. The Burmese men are thick-set, muscular, and active. The skin in the higher classes is a light olive-brown, but a darker brown in those people who are much exposed to the sun. The hair is black and straight, abundant on the head, but scanty on the face. The face itself is broad and flattish, the nostrils are usually spread out laterally and the nose is short. The eyes are wide asunder and inclined to be oblique and almond-shaped. The lips are not thick and projecting as in the negro.

The Karens consist of three divisions,\* the Pghos (Pwos), who are found along the sea-board of Tenasserim from Moulmein to Tavoy and Mergin; the Chghaws (Sgau), who occupy the hills and jungles of the lower part of the Irrawaddy river, in the district of Henzada on the right bank, and those of Prome and Shwegyin on the left bank, as far east as the Salween river. The Bghai (Bwi) division are found in the Toungoo hill-tracts which lie to the east of Prome. Mr SMEATON says that the Karens are short in stature, but broad and muscular. A Karen man from the Toungoo district who died in the jail at Insein, and whose skull was presented to me by Major BELL, was 5 ft. 1¾ in. high. The skin is naturally fair, like that of the Chinese, and the features of those of pure blood are, according to Mr SMEATON, Caucasian in type. The hair is black and straight; the eyes are black, though in the north brownish hair and hazel eyes are sometimes found. It is difficult to give the original home of the Karens. The prevailing opinion, however, is that they left the borders of Tibet and passed through Western China on their way to Burma.

The Shans (Htai or Tai, to employ their own name), on the eastern frontier of Burma, are divided into the Chinese Shans, the Salween Shans and the Siamese Shans. They form a number of tribes, which occupy the hill-ranges, elevated plateaus and valleys of the extensive tract of country in which they dwell.† They present differences in their physical characters in different districts. Dr ANDERSON states that the Shans dwelling in the valleys have the sallow tint of the Chinese, usually with red cheeks, dark brown eyes, black hair, face generally rather short, broad and flat, cheek bones prominent, a faint obliquity and contraction of the outer angle of the eyelids as in the Chinese. The

\* *The Loyal Karens of Burma*, by D. M'Kenzie Smeaton. London, 1887.

† The Shan country has been visited by many travellers. The works that I have consulted are Dr John Anderson's *Expedition to Western Yunan*, 1871; *Report on Administration of Shan States for 1889-90 and 1892-93*, by J. G. Scott; *Census of Burma*, 1891; Colonel Woodthorpe in *Journ. Anthropol. Inst.*, August 1896, vol. xxvi. p. 13; *From Tonquin to India*, by Prince Henri d'Orleans, 1898.

nose is well formed, not so broad and depressed as in the Burmese, and the bridge is usually prominent, almost aquiline. In the higher ranks the features are, he says, decidedly Tartar. The Hill Shans (Poloungs) have darker skins and are shorter than the Shans of the valleys, the average height of the valley men being 5 ft. 8 in. or less. The Chinese Shans are described as resembling Laplanders in their squat figures, broad, short, round, flat faces, and prominent cheek bones. Like the Nágás, they do not drink milk.

Mr SCOTT, in his account of the Keing Tung Shans, says that in stature and complexion they do not differ materially from the Western Shans. The nose, though small, is straight and not flattened out or button-shaped, and without a bridge, as in the people west of the Salween river. Of the hill races the Kwi are short in stature, and grow the hair to its full length. The Leu tribe, again, cut the hair short except a short tail. He speaks of a tribe as the wild Wās, who treat the hair like the Leus; whose skins are as dark as negroes or negritos, and who go naked or nearly naked. They decorate their villages with the skulls of animals, as well as with human skulls, for the people are head-hunters. The wild Wa country is a little to the south of 23° lat., and a little to the east of 19° long.

As a rule the Shans are civilised. They are Buddhists, and although not so prominent a political power as they were some centuries ago, they are organised into principalities. They are agriculturists and traders, weavers, dyers and expert workers in metals. They are properly clothed, and construct houses, monasteries and temples. Notwithstanding the differences observed amongst the tribes, it is obvious that the Mongolian cast of features is the prevailing type. They have Chinese affinities in both physical characters and language, and it seems probable that they have migrated from Western China.

The Southern or Siamese Shans have both a political and philological affinity to the kingdom of Siam. The form Siam is a corruption of the French method of writing Shan or Scian, and the original monosyllabic term has been converted by them into a word of two syllables.\*

I have had the opportunity of examining forty-four skulls collected in different parts of Burma, almost the whole of which are in the University Museum.

In 1889 my friend and former assistant, Surgeon-Major WM. B. BANNERMAN, who was attached to the military expedition to Upper Burma, presented me with the skulls of two Dacoits.† The one, an old man, was the leader of a band in the Ye-U district, and was shot by the military police at Mugan; his head was brought into the village of Ye-U for identification in August 1888. The other, named Pau-dun, was hanged for murder at Ye-U in June of the same year. Dr BANNERMAN states that the people in the Ye-U district have, as a rule, the bridge of the nose flattened with the point turned up, and with wide nostrils. The eyes have the Mongolian cast, the cheeks are broad, the hair is black, long and straight, the skin yellow, and with scarcely any hair on the face

\* *Report on Census of Burma*, 1891, p. 201. Rangoon, 1892.

† The Dacoits were the disbanded troops of King Thebaw's army. They were not hillmen, but Burmese.

except a lanky moustache. They are muscular, active, and under the average height of Europeans. The religion is Buddhist. From personal observations on infants and young children, Dr BANNERMAN has seen no evidence of modification from artificial pressure of the skull.

Another skull from Upper Burma, obtained at Mahlaing, Meiktila district, and said to be that of a Dacoit, was presented by Dr GEOFFREY H. PRANCE.

In the summer of 1895 I received from my friend and former assistant, Surgeon-Major G. J. H. BELL, a box containing the crania of sixteen men who had died in the central jail, of which he is the superintendent, at Insein, in Lower Burma. In 1897 the same gentleman forwarded to me a series of twenty skulls from this prison. The skulls were accompanied by explanatory lists, from which it appeared that thirty-two were Burmese, one was a Karen, one a Shan, and one a Mohammedan from Ralum, Akyab. Another, a Hindoo from the Coromandel coast, is not included in the following description. The name, jail number, sex, age, height, birthplace, crime for which imprisoned, and cause of death were given in the lists. To each specimen was appended a metal plate stamped with the jail number, the period of imprisonment, etc., which, I understand, it is customary for each criminal to wear suspended with a string around the neck. All the Burmese names have the prefix Nga,\* a term employed by a superior when addressing one of much inferior social status. In more than one instance the cranial and dental characters did not correspond with the age of the person having the jail number specified in the lists, so that either the criminal had mis-stated his age, or the attendant employed to clean the specimens had not been sufficiently careful to attach the proper metal plate to the skull.

Early in 1896 I received from Surgeon-Captain J. M. CRAWFORD the skull of Nga Pota, æt. 32, a Burmese prisoner who had died in 1895 of phthisis in the jail at Benares when under Dr CRAWFORD'S charge.

In March 1897 Miss VIOLET G. S. ADAMS presented to the Museum two skulls which had been dug up in an old cemetery in Upper Burma. They had the appearance of buried bones which had lost much of their organic matter. One, an adult, had female characters; the other was a male somewhat advanced in life.

In the collection of the Henderson Trust, now in the University Museum, is a skull, No. 158, presented in 1827 by Mr GEORGE LYON, who procured it from Ava proper in Upper Burma. A second specimen, No. 159 in the same collection, is also said to be from Burma, but the precise locality is not stated.

Through the courtesy of Professor D. J. CUNNINGHAM I have been able to examine the skull in the museum under his charge of a Shan, Nga To, from the Insein jail.

In the following description I have arranged and compared with each other in Part I. thirty-seven skulls which were marked Burmese by the collectors.† The

\* In the Abor Miri group of the Tibeto-Assam languages, Nga is the personal pronoun (see Report on *Census of Assam*, 1891, p. 183).

† Shan Gyi and San Min from the Insein jail were both catalogued as Burmese; their measurements are given in Table VI.

Burmese crania from the prison of Insein are those of men. They are mostly in the prime of life, although three present marks of age, and one is said to be only eighteen years old. The other Burmese crania are also of the male sex; one is an old man, one is said to be twenty-one years of age, the other three are adults.

*Part I. TABLES III., IV., V., VI.*

The skulls in this series gave, without doubt, a fair representation of the type met with amongst the male natives of Burma.

*Norma Verticalis*.—When arranged side by side on a table and examined from the *norma verticalis*, this series of skulls from Burma could be arranged in two more or less clearly defined groups. The one, which I shall designate Group A, included skulls, generally of a rounded form, and usually unsymmetrical in the parieto-occipital region, which, both from this character and from the steep vertical direction of the region in some of the specimens, gave evidence of the production of parieto-occipital flattening by artificial pressure applied during infancy. The unsymmetrical flattened surface in some specimens was directed obliquely to the right, in others obliquely to the left. In this group were a large proportion of the crania from the Insein jail, and five skulls not from that prison. All of these crania were brachycephalic, and several of them, as may be seen from the Tables, were hyper-brachycephalic. With three exceptions the vertex was not ridged in the sagittal region, nor did the vault slope rapidly downwards and outwards from the mesial suture to the parietal eminences. The curve of the vault in the vertical transverse direction from one parietal eminence to the other was not steep, and the skulls had generally a well-filled character.

The other Group, B, consisted of the remainder of the skulls from the jail at Insein. These had a more elongated form than those in Group A when examined from the *norma verticalis*. They did not show a definite want of symmetry in the parieto-occipital region, which, with one or two exceptions, was not so flattened and steep as in Group A, but sloped more gradually downwards and backwards into the occipital squama. As a rule these skulls did not reach the brachycephalic index, and they were usually longer than those in Group A. Two were dolichocephalic and elongated: one of these, San Min, with a length-breadth index 74, was said to be from the Southern Shan States, though marked Burman in the list sent along with the Insein skulls; the other, San Kun, with an index 74.9, was from the district of Monyo. In ten crania the cephalic index ranged from 75.3 to 79.5. In several the parietal eminences were prominent. Except in five crania there was no definite ridge in the sagittal line, and the slope outwards from it, as well as the curvature of the vault to the parietal eminences, was much the same as in Group A. As a rule the crania were cryptozygous both in A and B, but in some specimens in Group B the zygomatic arches could be distinctly seen from the *norma verticalis*.

*Norma Lateralis*.—In a few of the crania in both Groups A and B the glabella and supra-orbital ridges were moderately projecting; in others these ridges were so slight



as to be scarcely noticeable; but in none was the projection very strong. In one from the Insein jail an old depressed fracture was seen in the left frontal region just above the orbit; in two others from the same prison the frontal bone had been broken, and in a fourth the frontal and parietals had been extensively fractured during life. As a rule the forehead receded no more than one is accustomed to see in well-formed male skulls. The cranial vault was usually fairly well arched, and the parieto-occipital region showed the characters already described. In thirteen specimens the skulls rested behind on the tips of the mastoids, in the remainder on the cerebellar part of the occiput. In all the crania, with three exceptions, the occipital longitudinal arc was the shortest, and in most instances it was considerably below either the frontal or parietal. In twelve crania the parietal arc exceeded the frontal, and in three they were equal. The osseous bridge of the nose was often elongated, moderately projecting at its tip, and its outline was slightly concave. In the specimens with the projecting glabella the fronto-nasal suture was somewhat depressed, but the face did not show a marked flattening in the nasal region. The nasal spine of the superior maxillæ was, as a rule, only moderate, but in some skulls it was more strongly marked. A distinct ridge of demarcation separated the incisive region from the floor of the nose. In many of the crania the incisive region of the upper jaw was almost vertical, in others it projected slightly forward; it was exceptional to see a marked amount of alveolar prognathism. In some specimens the incisive and canine fossæ were deep. The orbits showed much variation in the relations of height and width.

In many of the crania the crowns of the teeth were flattened and much stained with betel-chewing. The palate was moderately arched; the mastoid processes, temporal and occipital ridges were not strong, as a rule, but in only a few specimens was theinion projecting. In a few of the crania the sutures were in process of obliteration, two skulls were metopic, the lambdoidal suture was usually free from Wormian bones, and in only two specimens were they numerous. The parieto-sphenoid articulation in the pterion was, as a rule, broad. Three skulls had an epipteric bone on one side, in one on both sides, and in two crania the squamous temporal articulated with the frontal on one side. No skull had an exostosis in the auditory meatus, but the left tympanic plate in one was much thickened at its free outer edge. In two skulls the external pterygoid plate was broadened backwards, but did not quite reach the spine of the sphenoid, so that the osseous boundary of a pterygo-spinous foramen was not completed. No skull had a third condyle, and in none was a para-mastoid process present, although in a few specimens the jugal process was tuberculated; an infra-orbital suture was occasionally seen. Variations from the normal ossification in this series of crania were therefore not common. As a rule the sutures of the cranial vault were simple in their denticulations.

The examination of the series of thirty-seven male skulls, and the study of their absolute and relative dimensions in certain diameters, as expressed in the tables of measurement, have given the following results.

TABLE III.

*Burmese, from Insein Prison.*

| Province and Name.                        | Prome. |       |            |           |            | Tharrawaddy. |             |          |          |           | Hanthawaddy. |          |           |           |
|---|--------|-------|------------|-----------|------------|--------------|-------------|----------|----------|-----------|--------------|----------|-----------|-----------|
|   | Maung. | Pyaw. | Shwe Hman. | Lu Ga La. | Shwe Htun. | Po Nwe.      | Shwe Gaung. | San Min. | Kwe Yoe. | Shwe Noe. | Ngwe Thee.   | Po Taan. | Kywet Oh. | Kya Huit. |
| Age, . . . . .                            | 23     | Aged. | Aged.      | 18        | 40         | 29           | 30          | 32       | 23       | 72        | 20           | 30       | 33        | Ad.       |
| Sex, . . . . .                            | M.     | M.    | M.         | M.        | M.         | M.           | M.          | M.       | M.       | M.        | M.           | M.       | M.        | M.        |
| Cubic capacity, . . .                     | ...    | 1460  | ...        | ...       | 1290       | ...          | ...         | 1820     | 1270     | 1340      | 1540         | ...      | ...       | 1440      |
| Glabello-occipital length, . . .          | 177    | 166   | 171        | 171       | 169        | 186          | 170         | 184      | 159      | 164       | 178          | 168      | 185       | 171       |
| Basi-bregmatic height, . . .              | 141    | 142   | 135        | 127       | 130        | 139          | 133         | 144      | 128      | 138       | 138          | 141      | 135       | 131       |
| Vertical Index, . . .                     | 79.7   | 85.5  | 78.9       | 74.3      | 76.9       | 74.7         | 78.2        | 78.3     | 80.5     | 84.1      | 77.5         | 83.9     | 73.0      | 76.6      |
| Minimum frontal diameter, . . .           | 101    | 94    | 88         | 93        | 87         | 93           | 87          | 96       | 89       | 92        | 96           | 98       | 99        | 92        |
| Stephanic diameter, . . .                 | ...    | 113   | 92         | 105       | 103        | 109          | 109         | 120      | 110      | 111       | 112          | 106      | 114       | 112       |
| Asterionic, . . .                         | 105    | 97    | 101        | 106       | 101        | 105          | 108         | 114      | 105      | 103       | 117          | 104      | 112       | 103       |
| Greatest parieto-squamous breadth, . . .  | 143    | 150s. | 134p.      | 140       | 140        | 140          | 142         | 153      | 142      | 139       | 148          | 145      | 147       | 141s.     |
| Cephalic Index, . . .                     | 80.8   | 90.4  | 78.4       | 81.9      | 82.8       | 75.3         | 83.5        | 83.2     | 89.3     | 84.8      | 83.1         | 86.3     | 79.5      | 82.5      |
| Horizontal circumference, . . .           | ...    | 503   | 487        | 499       | 485        | 520          | 495         | 536      | 475      | 484       | 515          | 491      | 529       | 495       |
| Frontal longitudinal arc, . . .           | 134    | 129   | 130        | 126       | 121        | 137          | 129         | 135      | 121      | 127       | 128          | 111      | 130       | 122       |
| Parietal, . . .                           | 140    | 123   | 128        | 115       | 124        | 133          | 120         | 137      | 104      | 118       | 106          | 119      | 134       | 127       |
| Occipital, . . .                          | 111    | 109   | 100        | 112       | 100        | 123          | 111         | 125      | 98       | 111       | 128          | 112      | 121       | 109       |
| Total, . . .                              | 385    | 361   | 358        | 353       | 345        | 393          | 360         | 397      | 323      | 356       | 362          | 342      | 385       | 358       |
| Vertical transverse arc, . . .            | 317    | 323   | 298        | 300       | 290        | 308          | 294         | 328      | 302      | 306       | 312          | 304      | 312       | 303       |
| Length of foramen magnum, . . .           | 34     | 32    | 33         | 36        | 35         | 33           | 35          | 37       | 38       | 33        | 38           | 36       | 33        | 35        |
| Basi-nasal length, . . .                  | 96     | 103   | 96         | 97        | 97         | 99           | 95          | 99       | 98       | 97        | 104          | 107      | 100       | 96        |
| Basi-alveolar length, . . .               | 97     | 102   | 93         | 98        | 93         | 97           | 88          | 100      | 93       | ...       | 98           | 101      | 101       | 91        |
| Gnathic Index, . . .                      | 101.0  | 99.   | 96.9       | 101.0     | 95.9       | 98.0         | 92.6        | 101.0    | 94.9     | ...       | 94.2         | 94.4     | 101.0     | 94.8      |
| Interzygomatic breadth, . . .             | 137    | 141   | 123        | 134       | 134        | 132          | 130         | 135      | 127      | 132       | 138          | 144      | 138       | 129       |
| Intermalar, . . .                         | 123    | 124   | 122        | 120       | 118        | 117          | 115         | 121      | 112      | 121       | 124          | 128      | 127       | 119       |
| Nasio-mental length, . . .                | 117    | 122   | 117        | 112       | 117        | 120          | 118         | 114      | 113      | 103       | 115          | 114      | 120ap     | 106       |
| Nasio-mental complete facial Index, . . . | 85.4   | 86.5  | 91.4       | 83.5      | 87.3       | 90.9         | 90.7        | 84.4     | 88.3     | 78.0      | 83.3         | 72.3     | 86.5      | 82.1      |
| Nasio-alveolar length, . . .              | 72     | 72    | 73         | 67        | 70         | 71           | 74          | 69       | 67       | ...       | 71           | 73       | 75        | 62        |
| Maxillary upper facial Index, . . .       | 52.5   | 51.   | 57.        | 50.       | 52.2       | 53.7         | 56.9        | 51.1     | 52.7     | ...       | 51.4         | 50.6     | 54.3      | 48.       |
| Nasal height, . . .                       | 55     | 54    | 54         | 53        | 54         | 52           | 53          | 51       | 53       | 48        | 56           | 58       | 50        | 48        |
| Nasal width, . . .                        | 22     | 26    | 27         | 25        | 25         | 26           | 21          | 27       | 22       | 25        | 23           | 28       | 26        | 23        |
| Nasal Index, . . .                        | 40.0   | 43.1  | 50.        | 47.2      | 46.3       | 50.0         | 39.6        | 52.9     | 41.5     | 52.1      | 41.1         | 48.3     | 52.0      | 47.9      |
| Orbital width, . . .                      | 43     | 42    | 39         | 38        | 39         | 39           | 37          | 38       | 40       | 38        | 41           | 42       | 43        | 39        |
| Orbital height, . . .                     | 33     | 37    | 32         | 36        | 34         | 36           | 36          | 34       | 38       | 32        | 35           | 33       | 35        | 30        |
| Orbital Index, . . .                      | 76.7   | 88.1  | 82.        | 94.7      | 87.2       | 92.3         | 97.3        | 89.5     | 95.0     | 84.2      | 85.4         | 78.6     | 81.4      | 76.9      |
| Palato-maxillary length, . . .            | 56     | 57    | 57         | 51        | 58         | 54           | 52          | 57       | 49       | ...       | 51           | 65       | 59        | 50        |
| Palato-maxillary breadth, . . .           | 63     | 70    | 61         | 67        | 64         | 65           | 66          | 66       | 55       | 64        | 64           | 69       | 70        | 61        |
| Palato-maxillary Index, . . .             | 112.2  | 122.8 | 107.       | 131.3     | 120.       | 120.3        | 126.9       | 115.7    | 112.2    | ...       | 125.5        | 106.1    | 118.6     | 122.2     |
| Lower jaw. { Symphysial height, . . .     | 34     | 35    | 30         | 29        | 31         | 36           | 32          | 31       | 29       | 30        | 31           | 30       | 33        | 30        |
| { Coronoid, . . .                         | 63     | 64    | 65         | 62        | 64         | 65           | 62          | 68       | 55       | 60        | 65           | 68       | 66        | 51.       |
| { Condylod, . . .                         | 65     | 64    | 65         | 60        | 63         | 68           | 65          | 63       | 60       | 60        | 63           | 67       | 69        | 53        |
| { Gonio-symphysial length, . . .          | 86     | 89    | 85         | 88        | 89         | 93           | 86          | 90       | 92       | 87        | 90           | 94       | 95        | 80        |
| { Inter-gonial width, . . .               | 97     | 97    | 97         | 94        | 95         | 105          | 104         | 93       | 94       | 98        | 97           | 109      | 111       | 104       |
| { Breadth of ascending ramus, . . .       | 35     | 37    | 36         | 39        | 36         | 36           | 29          | 40       | 35       | 36        | 37           | 38       | 40        | 31        |

TABLE IV.

*Burmese, from Insein Prison.*

| Name, with Place or Province.                 | Pyn Win, Zikaywa. | Lon Htaw, Zibungon. | Pe, Sharsaybo. | Lu Gyi, Mony. | San Kun, Monyo. | Noo, Aleywa. | Chut, Yaykayon. | Tun Yan, Mahatham. | Shwe In, Sagaing. | ShweByaung, Pakokko. | Tun Tha, Gounyindan. | Fu, Aungmyingain. | Tun U, Myaung. | Aung Myat, Yebouk. | Kyout Lon, Sakangyi. |
|---|-------------------|---------------------|----------------|---------------|-----------------|--------------|-----------------|--------------------|-------------------|----------------------|----------------------|-------------------|----------------|--------------------|----------------------|
| Age, . . . . .                                | 61                | 35                  | Ad.            | 52            | Ad.             | 52           | 56              | 57                 | 60                | 44                   | 29                   | Ad.               | 33             | 30                 | Adult.               |
| Sex, . . . . .                                | M.                | M.                  | M.             | M.            | M.              | M.           | M.              | M.                 | M.                | M.                   | M.                   | M.                | M.             | M.                 | M.                   |
| Cubic capacity, . . . . .                     | 1240              | 1235                | 1480           | ...           | 1240            | 1670         | 1350            | ...                | 1350              | 1480                 | 1340                 | 1380              | 1445           | 1445               | 1315                 |
| Glabello-occipital length, . . . . .          | 173               | 168                 | 167            | 170           | 179             | 179          | 179             | 185                | 172               | 179                  | 161                  | 168               | 183            | 170                | 167                  |
| Basal-bregmatic height, . . . . .             | 132               | 133                 | 131            | 139           | 130             | 139          | 141             | 145                | 132               | 136                  | 136                  | 131               | 140            | 136                | 130                  |
| Vertical Index, . . . . .                     | 76.3              | 79.2                | 78.4           | 81.8          | 72.6            | 77.7         | 78.8            | 78.4               | 76.7              | 76.0                 | 84.5                 | 78.               | 76.5           | 80.                | 77.8                 |
| Minimum frontal diameter, . . . . .           | 93                | 94                  | 91             | 92            | 91              | 98           | 95              | 98                 | 92                | 94                   | 95                   | 91                | 88             | 93                 | 90                   |
| Stephanic diameter, . . . . .                 | 105               | 108                 | 112            | 109           | 102             | 121          | 108             | 113                | 118               | 111                  | 110                  | 101               | 102            | 117                | 111                  |
| Asterionic, . . . . .                         | 106               | 105                 | 104            | 111           | 107             | 112          | 119             | 114                | 107               | 111                  | 111                  | 105               | 100            | 104                | 107                  |
| Greatest parieto-squamous breadth, . . . . .  | 136s.             | 133s.               | 147s.          | 145s.         | 134s.           | 151s.        | 139s.           | 140                | 140               | 142                  | 146s.                | 132s.             | 143s.          | 147p.              | 142s.                |
| Cephalic Index, . . . . .                     | 78.6              | 79.2                | 88.            | 85.3          | 74.9            | 84.4         | 77.7            | 75.7               | 81.4              | 79.3                 | 90.7                 | 78.6              | 78.1           | 86.5               | 85.                  |
| Horizontal circumference, . . . . .           | 493               | 478                 | 502            | 498           | 494             | 527          | 510             | 518                | 500               | 516                  | 484                  | 485               | 505            | 503                | 489                  |
| Frontal longitudinal arc, . . . . .           | 121               | 129                 | 126            | 129           | 124             | 135          | 129             | 137                | 123               | 129                  | 129                  | 125               | 133            | 131                | 128                  |
| Parietal, . . . . .                           | 127               | 118                 | 127            | 118           | 124             | 140          | 121             | 126                | 123               | 129                  | 103                  | 127               | 130            | 126                | 115                  |
| Occipital, . . . . .                          | 107               | 99                  | 109            | 105           | 106             | 113          | 115             | 124                | 112               | 113                  | 106                  | 99                | 126            | 112                | 113                  |
| Total, . . . . .                              | 355               | 346                 | 362            | 352           | 354             | 383          | 365             | 387                | 358               | 371                  | 338                  | 351               | 389            | 369                | 356                  |
| Vertical transverse arc, . . . . .            | 290               | 291                 | 311            | 310           | 280             | 325          | 301             | 311                | 300               | 301                  | 306                  | 291               | 305            | 317                | 304                  |
| Length of foramen magnum, . . . . .           | 35                | 36                  | 35             | 35            | 29              | 39           | 33              | 37                 | 35                | 36                   | 35                   | 33                | 31             | 29                 | 33                   |
| Basal-nasal length, . . . . .                 | 96                | 94                  | 89             | 103           | 109             | 98           | 106             | 101                | 95                | 102                  | 99                   | 95                | 101            | 95                 | 93                   |
| Basal-alveolar length, . . . . .              | 92                | 95                  | 108            | 93            | 111             | 96           | 106             | 98                 | 96                | 102                  | 96                   | 98                | 96             | 92                 | 97                   |
| Gnathic Index, . . . . .                      | 95.8              | 101.1               | 121.3          | 90.3          | 101.8           | 98.          | 100.            | 92.1               | 101.1             | 100.                 | 97.                  | 103.2             | 95.            | 96.3               | 104.3                |
| Interzygomatic breadth, . . . . .             | 125               | 130                 | 123            | 132           | 136             | 137          | 138             | 137                | 132               | 139                  | 142                  | 130               | 130            | 131                | 128                  |
| Intermalar, . . . . .                         | 117               | 121                 | 120            | 121           | 127             | 127          | 126             | 126                | 115               | 126                  | 131                  | 118               | 119            | 118                | 113                  |
| Nasio-mental length, . . . . .                | 108               | 106                 | 116            | 117           | 122             | 122          | 118             | 122ap              | 112               | 120                  | 113                  | 109               | 120            | 116                | 115                  |
| Nasio-mental complete facial Index, . . . . . | 86.4              | 81.5                | 87.2           | 88.6          | 89.6            | 89.          | 85.5            | 89.0               | 84.8              | 86.3                 | 79.5                 | 83.8              | 92.3           | 88.5               | 89.8                 |
| Nasio-alveolar length, . . . . .              | 66                | 63                  | 68             | 71            | 71              | 75           | 69              | 74                 | 65                | 74                   | 68                   | 64                | 73             | 69                 | 66                   |
| Maxillary upper facial Index, . . . . .       | 52.8              | 48.4                | 51.1           | 53.7          | 52.2            | 54.7         | 50.             | 54.0               | 49.2              | 53.2                 | 47.8                 | 49.2              | 56.1           | 52.6               | 51.5                 |
| Nasal height, . . . . .                       | 52                | 49                  | 48             | 52            | 54              | 56           | 53              | 53                 | 50                | 55                   | 51                   | 49                | 55             | 48                 | 48                   |
| Nasal width, . . . . .                        | 29                | 26                  | 24             | 25            | 32              | 27           | 27              | 27                 | 26                | 25                   | 26                   | 23                | 25             | 24                 | 23                   |
| Nasal Index, . . . . .                        | 55.8              | 53.1                | 50.            | 48.2          | 59.1            | 48.2         | 50.9            | 50.9               | 52.0              | 45.5                 | 51.                  | 46.9              | 45.5           | 50.                | 47.9                 |
| Orbital width, . . . . .                      | 38                | 36                  | 40             | 37            | 40              | 40           | 39              | 43                 | 40                | 39                   | 40                   | 38                | 40             | 37                 | 36                   |
| Orbital height, . . . . .                     | 34                | 32                  | 35             | 35            | 34              | 37           | 34              | 32                 | 32                | 33                   | 35                   | 31                | 30             | 33                 | 30                   |
| Orbital Index, . . . . .                      | 89.5              | 88.9                | 87.5           | 94.6          | 85.             | 92.5         | 87.2            | 74.4               | 80.0              | 84.6                 | 87.5                 | 81.6              | 75.            | 89.2               | 83.3                 |
| Palato-maxillary length, . . . . .            | 50                | 53                  | 50             | 49            | 60              | 57           | 55              | 50                 | 54                | 62                   | 54                   | 53                | 55             | 54                 | 54                   |
| Palato-maxillary breadth, . . . . .           | 59                | 60                  | 64             | 66            | 72              | 71           | 70              | 68                 | ...               | 68                   | 67                   | 64                | 68             | 64                 | 62                   |
| Palato-maxillary Index, . . . . .             | 118.              | 113.2               | 128.           | 134.6         | 120.            | 124.5        | 127.2           | 136.0              | ...               | 109.6                | 124.                 | 120.7             | 123.6          | 118.5              | 114.8                |
| Lower jaw. { Symphysial height, . . . . .     | 28                | 28                  | 36             | 29            | 33              | 32           | 36              | 38                 | 27                | 35                   | 30                   | 40                | 32             | 33                 | 34                   |
| Coronoid, . . . . .                           | 63                | 55                  | 61             | 64            | 62              | 61           | 70              | 62                 | 65                | 71                   | 63                   | 62                | 60             | 66                 | 65                   |
| Condylod, . . . . .                           | 66                | 64                  | 64             | 64            | 67              | 64           | 73              | 66                 | 66                | 74                   | 68                   | 67                | 69             | 67                 | 61                   |
| Gonio-symphysial length, . . . . .            | 90                | 86                  | 83             | 86            | 94              | 90           | 94              | 80                 | 90                | 91                   | 94                   | 89                | 79             | 85                 | 84                   |
| Inter-gonial width, . . . . .                 | 93                | 105                 | 103            | 100           | 102             | 115          | 106             | 98                 | 98                | 97                   | 110                  | 83                | 88             | 93                 | 99                   |
| Breadth of ascending ramus, . . . . .         | 38                | 37                  | 32             | 35            | 40              | 32           | 44              | 37                 | 36                | 33                   | 40                   | 40                | 34             | 34                 | 33                   |

TABLE V.

*Burmese.*

| Name or Native Place.                         | Ava<br>Proper. | Saung.<br>Ava. | Upper<br>Burma,<br>Mahaing,<br>Meiktila<br>District. | Pandun.<br>Ye-U. | Mugan.<br>Ye-U. | Nga<br>Pota. |
|---|----------------|----------------|--|------------------|-----------------|--------------|
| Collection, . . . . .                         | H.T. 158       | Insein.        | E. U. A. M.  | E. U. A. M.      | E. U. A. M.     | E. U. A. M.  |
| Age, . . . . .                                | Ad.            | 53             | Ad.  | 21               | Aged.           | 32           |
| Sex, . . . . .                                | M.             | M.             | M.   | M.               | M.              | M.           |
| Cubic capacity, . . . . .                     | 1248           | 1330           | 1300   | 1405             | 1160            | 1600         |
| Glabello-occipital length, . . . . .          | 158            | 172            | 173  | 178              | 163             | 176          |
| Basi-bregmatic height, . . . . .              | 131            | 139            | 132  | 131              | 127             | 140          |
| Vertical Index, . . . . .                     | 82.9           | 80.8           | 76.3   | 73.6             | 77.9            | 79.5         |
| Minimum frontal diameter, . . . . .           | 92             | 92             | 96   | 92               | 93              | 97           |
| Stephanic diameter, . . . . .                 | 112            | 109            | 110  | 109              | 105             | 114          |
| Asterionic " . . . . .                        | 106            | 109            | 104  | 108              | 105             | 111          |
| Greatest parieto-squamous breadth, . . . . .  | 141s.          | 139            | 139s.  | 143s.            | 140s.           | 147s.        |
| Cephalic Index, . . . . .                     | 89.2           | 80.8           | 80.3   | 80.3             | 85.9            | 83.5         |
| Horizontal circumference, . . . . .           | 481            | 486            | 500  | 515              | 482             | 515          |
| Frontal longitudinal arc, . . . . .           | 118            | 123            | 129  | 130              | 124             | 132          |
| Parietal " " . . . . .                        | 112            | 115            | 117  | 125              | 117             | 129          |
| Occipital " " . . . . .                       | 100            | 106            | 107  | 108              | 102             | 107          |
| Total " " . . . . .                           | 330            | 344            | 353  | 363              | 343             | 368          |
| Vertical transverse arc, . . . . .            | 305            | 298            | 297  | 306              | 293             | 314          |
| Length of foramen magnum, . . . . .           | 37             | 38             | 33   | 36               | 33              | 38           |
| Basi-nasal length, . . . . .                  | 97             | 102            | 99   | 100              | 91              | 102          |
| Basi-alveolar length, . . . . .               | 98             | 103            | 100  | 95               | ...             | 96           |
| Gnathic Index, . . . . .                      | 101.           | 101.0          | 101.   | 95.              | ...             | 94.1         |
| Interzygomatic breadth, . . . . .             | 135            | 139            | 134  | 131              | 130             | 138          |
| Intermalar " . . . . .                        | 123            | 125            | 125  | 119              | 121             | 123          |
| Nasio-mental length, . . . . .                | ...            | 116            | 110  | 130              | ...             | ...          |
| Nasio-mental complete facial Index, . . . . . | ...            | 83.4           | 82.  | 99.2             | ...             | ...          |
| Nasio-alveolar length, . . . . .              | 71             | 69             | 63   | 74               | ...             | 70           |
| Maxillary upper facial Index, . . . . .       | 52.5           | 49.6           | 47.  | 56.4             | ...             | 50.7         |
| Nasal height, . . . . .                       | 52             | 52             | 49   | 53               | 46              | 56           |
| Nasal width, . . . . .                        | 26             | 24             | 26   | 22               | 25              | 28           |
| Nasal Index, . . . . .                        | 50.            | 46.0           | 53.1   | 41.5             | 54.3            | 50.          |
| Orbital width, . . . . .                      | 40             | 39             | 41   | 40               | 36              | 40           |
| Orbital height, . . . . .                     | 31             | 33             | 31   | 33               | 34              | 33           |
| Orbital Index, . . . . .                      | 77.5           | 84.6           | 75.6   | 82.5             | 94.4            | 82.5         |
| Palato-maxillary length, . . . . .            | 53             | 56             | 55   | 53               | ...             | 61           |
| Palato-maxillary breadth, . . . . .           | 68             | 63             | 66   | 61               | ...             | 64           |
| Palato-maxillary Index, . . . . .             | 128.3          | 112.2          | 120.   | 115.             | ...             | 125.5        |
| Lower jaw. { Symphysial height, . . . . .     | ...            | 29             | 31   | 37               | ...             | ...          |
| Coronoid " . . . . .                          | ...            | 63             | 74   | 60               | 54              | ...          |
| Condylod " . . . . .                          | ...            | 64             | 64   | 62               | 61              | ...          |
| Gonio-symphysial length, . . . . .            | ...            | 88             | 93   | 88               | 82              | ...          |
| Inter-gonial width, . . . . .                 | ...            | 104            | 100  | 86               | 94              | ...          |
| Breadth of ascending ramus, . . . . .         | ...            | 42             | 38   | 40               | 35              | ...          |

In the glabello-occipital length the crania ranged from a maximum 186 mm. to a minimum 158 mm., and the mean of the series was 172·8 mm. In their parieto-squamous breadth the maximum was 153 mm., the minimum 132 mm., and the mean 141·7 mm. The mean length-breadth (cephalic) index was 82·1, which placed the series well into the brachycephalic group. In only two crania was this index below 75, and of the ten specimens which were mesaticephalic eight were above 77·5, i.e., nearer to the brachycephalic than to the dolichocephalic standard. On the other hand eight specimens had a cephalic index of 85 or upwards, and two of these were above 90, so that a sensible proportion were hyper-brachycephalic. Both as regards the numerical index and the configuration of the cranium generally, there can be no doubt that the customary form of the Burmese skull is brachycephalic. The few exceptional specimens which had an elongated shape and an index either dolichocephalic or approximating thereto, are probably to be regarded as affiliated to the people with dolichocephalic skulls described in the earlier paragraphs in Part II.

In the basi-bregmatic height the crania ranged from a maximum of 145 mm. to a minimum of 127 mm., and the mean was 135·1 mm. The mean length-height (vertical) index was 78·2, which placed the series in the group of skulls termed akrocephalic or hypsicephalic, i.e., with a high vertical index. But notwithstanding this relatively high index, in only three specimens did the vertical index slightly exceed the cephalic, and in two others they were equal. That the breadth of the skull is greater than the height is therefore a character which prevails in the Burmese skull.

The mean stephanic diameter, 109·2 mm., slightly exceeded the mean asterionic diameter, 106·8 mm., and the mean minimum frontal diameter was 93·1 mm. The bizygomatic diameter with a mean of 133·7 mm. ranged from 125 to 144 mm., and in each skull it invariably exceeded the intermalar.

The measurements made for the purpose of determining the length and breadth of the face gave the following results:—In thirty-five skulls the lower jaw was present, and the complete nasio-mental diameter, which ranged from 103 to 130 mm., had a mean length of 115·7 mm.; in its relation to the bizygomatic diameter the resulting index was in the mean 86·3, which places the crania in the chamæprosopic or low-faced group of Kollmann. In only six specimens did the index exceed 90, so as to bring these crania into the leptoprosopic division. In these skulls the upper facial index gave a different result, for although it had a range from 47 to 57, the mean was 52, which places the face generally in the leptoprosopic or high upper face group, and no fewer than twenty-six of these crania came into this category. The vertical diameter of the lower jaw in the mental region does not therefore contribute proportionally to the length of the face in the same measure as the vertical diameter of the superior maxilla.

In eighteen skulls the basi-nasal diameter was greater than the basi-alveolar, in thirteen it was slightly less, in one materially less, and in two they were equal. The mean gnathic index, calculated on the relations of these two diameters, was 98·9, which

shows how nearly equal they were in their mean relative proportions, so that they fall into the mesognathic group. It was exceptional to see a marked degree of alveolar prognathism.

The mean nasal index was 48·6, thus on the average the nasal height was something more than twice the width; though in the individual specimens the index ranged from 40·0 to 59·1. They came collectively just within the mesorhine group, but five specimens had the index above 53, i.e., were platyrhine, and fourteen were leptorhine. The mean orbital index was 85·0, though in individual orbits it ranged from 73·2 to 97·3; the skulls collectively came within the mesoseme group, though ten were megaseme and fourteen were microseme. The mean palato-maxillary index was 119·7, and the range was from 106·8 to 136·0. In twenty-four specimens the index was 115 and upwards; they were brachyuranic, and showed a wide palato-alveolar diameter in relation to the length.

As regards the cubic capacity it must be remembered that all the skulls were males. The mean of twenty-eight specimens capable of being measured was 1388 c.c., which places them in the mesocephalic group. One skull had a capacity of only 1160 c.c.; two were 1600 and 1670 c.c. respectively, and one had the remarkably high capacity 1820 c.c.; but these were exceptional, and the usual capacity ranged from 1240 to 1450 c.c.

To sum up, the Burmese proper are brachycephalic; as a rule the cranial breadth is greater than the height; the face is low, chamæprosopic; the upper jaw is moderately projecting, mesognathic; the nasal width is moderate in relation to the height; the orbits vary in their dimensions, but the mean is mesoseme; the palato-alveolar arch is wide in relation to the length; the cranial capacity is moderate.

## Part II. TABLE VI.

In this part are included the description of some skulls from Burma, which apparently belonged to tribes that form distinct elements in the population, and which may very properly be considered apart from those which belonged to the customary type of the people. With one exception, they were all apparently men.

H. T., No. 159 (Table VI.), referred to on page 728, though catalogued by the Henderson Trust as a Burmese skull, is not associated with any definite locality, and on this account and from its special character it has not been included in the preceding description. In the proportion of length and breadth it was distinctly dolichocephalic (72·2), and its outline in the *norma verticalis* was so elongated that it presented a striking contrast to the usual brachycephalic Burmese cranium. It was keeled in the anterior half of the sagittal region, from which the parietals sloped downwards to their eminences, below which the side walls of the skull were almost vertical. It differed also from the customary type of the Burmese skulls in having its basibregmatic height and vertical index considerably higher than its greatest breadth and cephalic index. The skull was phænozygous. The forehead was narrow, but was

almost vertical. The glabella and supra-orbital ridges were feeble. The nasal bridge was concave, depressed above and slightly projecting below; the anterior nares were wide, and the nasal index was distinctly platyrrhine. The nasal spine of the superior maxillæ was moderate, and an imperfect ridge separated the incisive region from the floor of the nose. The absence of the lower jaw prevented the proportions of the entire face from being taken, but the upper face was leptoprosopic. Some small Wormian bones were in the lambdoidal suture, and there was a large left epipteric bone. The prognathism of the upper jaw was well marked; the breadth of the orbit was materially greater than the height, and the index was microseme. The combination of the most important of these characters caused the skull to differ from the type described in Part I., so that it does not possess the customary features of a Burmese skull.

The two skulls obtained from an old cemetery in upper Burma also differed materially in character from the brachycephalic crania sent to me from the Insein jail. They were both distinctly dolichocephalic both in form and measurements, and in each specimen the height exceeded the breadth. In this respect they corresponded with the skull 159 above described in the collection of the Henderson Trust. They did not, however, possess the prognathic condition of the upper jaw, which was a feature in that specimen. Although the nasal bones were not projecting, the proportions of the nose were not platyrrhine. As the two dimensions of the orbit were more nearly on an equality, the orbital index was higher than in 159. The breadth of the palato-maxillary arch, in relation to the length, was not so great. In the male skull there was a small inter-parietal bone, and in the female, Wormian bones were in the lambdoidal suture. In one pterion in the female the ali-sphenoid had a very slight articulation with the parietal, in the other they were separated by a process continuous with the squamous temporal.

It is obvious that a certain admixture with the brachycephalic Burmese of a race or races with dolichocephalic proportions of the skull is to be found in Burma. It is possible that they may be the descendants of the aboriginal people, or be those of persons, or the descendants of persons, who had migrated into Burma from the hill districts at present inhabited by a dolichocephalic race.

One of the skulls from Insein, marked Erinia, was from Ralum, Akyab, in the northern part of Burma, south of Chittagong, where the people are for the most part Mahommedans. It was that of a man, said to be seventy years of age, whose height was 5 ft. 6 in. The condition of the sutures and the state of the teeth proved it to be that of a person who had passed middle life. The skull was hyper-brachycephalic, with a vertical parieto-occipital region, which pointed to artificial flattening during infancy. The height of the cranium was considerably less than the breadth. The skull was cryptozygous. The glabella and supra-orbital ridges were well marked, and the forehead sloped gently backwards and upwards. The nasal bridge was moderate in length, slightly concave, and somewhat depressed at the root; the nasal index was platyrrhine. The upper jaw was not prognathous, the incisive region was short, but separated from

TABLE VI.

*Karen, Shan, etc.*

| Name, or Native Place or Province.               | Burma,<br>no<br>Locality. | Here,<br>Toungoo,<br>Karen. | Erinia,<br>Akyab. | Ko<br>Nanda,<br>Shan. | To,<br>Shan<br>State,<br>Yunnan. | Shan<br>Gyi,<br>Tharra-<br>waddy. | San Min,<br>Southern<br>Shan<br>States. | Old<br>Cemetery,<br>Upper<br>Burma. | Old<br>Cemetery,<br>Upper<br>Burma. |
|--|---------------------------|-----------------------------|-------------------|-----------------------|----------------------------------|-----------------------------------|---|-------------------------------------|-------------------------------------|
| Collection, . . . . .                            | H.T. 159                  | Insein.                     | Insein.           | Insein.               | T.C.D.                           | Insein.                           | Insein.                                 | E.U.A.M.                            | E.U.A.M.                            |
| Age, . . . . .                                   | Ad.                       | 23                          | 70                | 40                    | 27                               | 55                                | 24                                      | Aged.                               | Ad.                                 |
| Sex, . . . . .                                   | M.                        | M.                          | M.                | M.                    | M.                               | M.                                | M.                                      | M.                                  | F.                                  |
| Cubic capacity, . . . . .                        | 1345                      | 1420                        | 1410              | ...                   | 1510                             | 1360                              | 1380                                    | ...                                 | 1270                                |
| Glabello-occipital length, . . . . .             | 180                       | 175                         | 167               | 186                   | 178                              | 175                               | 181                                     | 185                                 | 181                                 |
| Basi-bregmatic height, . . . . .                 | 136                       | 134                         | 136               | 147                   | 146                              | 135                               | 133                                     | 138                                 | 135                                 |
| Vertical Index, . . . . .                        | 75.6                      | 76.6                        | 81.4              | 79.0                  | 82.0                             | 77.1                              | 73.5                                    | 74.6                                | 74.6                                |
| Minimum frontal diameter, . . . . .              | 91                        | 85                          | 92                | 96                    | 94                               | 96                                | 89                                      | 89                                  | 93                                  |
| Stephanic diameter, . . . . .                    | 101                       | 106                         | 116               | 110                   | 107                              | 108                               | 107                                     | 108                                 | 109                                 |
| Asterionic, . . . . .                            | 103                       | 105                         | 115               | 113                   | 109                              | 101                               | 106                                     | 105                                 | 102                                 |
| Greatest parieto-squamous<br>breadth, . . . . .  | 130p.                     | 141                         | 150               | 150                   | 140                              | 140                               | 134                                     | 135                                 | 129                                 |
| Cephalic Index, . . . . .                        | 72.2                      | 80.6                        | 89.8              | 80.6                  | 78.7                             | 80.0                              | 74.0                                    | 73.                                 | 71.3                                |
| Horizontal circumference, . . . . .              | 504                       | 498                         | 501               | 538                   | 505                              | 506                               | 502                                     | 518                                 | 502                                 |
| Frontal longitudinal arc, . . . . .              | 132                       | 128                         | 127               | 133                   | 117                              | 120                               | 122                                     | 123                                 | 121                                 |
| Parietal, . . . . .                              | 120                       | 118                         | 118               | 140                   | 135                              | 140                               | 124                                     | 253                                 | 120                                 |
| Occipital, . . . . .                             | 124                       | 116                         | 110               | 124                   | 122                              | 110                               | 114                                     |                                     | 125                                 |
| Total, . . . . .                                 | 376                       | 362                         | 355               | 397                   | 374                              | 370                               | 360                                     | 376                                 | 366                                 |
| Vertical transverse arc, . . . . .               | 302                       | 300                         | 317               | 320                   | 306                              | 301                               | 292                                     | 308                                 | 296                                 |
| Length of foramen magnum, . . . . .              | 35                        | 32                          | 32                | 35                    | 34                               | 31                                | 36                                      | 33                                  | 34                                  |
| Basi-nasal length, . . . . .                     | 97                        | 97                          | 106               | 102                   | 107                              | 103                               | 102                                     | 103                                 | 100                                 |
| Basi-alveolar length, . . . . .                  | 105                       | 97                          | 104               | 101                   | 100                              | 109ap                             | 105                                     | 96                                  | 99                                  |
| Gnathic Index, . . . . .                         | 108.2                     | 100.                        | 98.1              | 99.0                  | 93.5                             | 105.8                             | 102.9                                   | 93.2                                | 99.0                                |
| Interzygomatic breadth, . . . . .                | 130                       | 121                         | 140               | 140                   | 141                              | 138                               | 125                                     | ...                                 | ...                                 |
| Intermalar, . . . . .                            | 119                       | 109                         | 125               | 123                   | 118                              | 129                               | 112                                     | ...                                 | ...                                 |
| Nasio-mental length, . . . . .                   | ...                       | 109                         | 113               | 129                   | 113                              | 120                               | 115                                     | ...                                 | 114                                 |
| Nasio-mental complete facial<br>Index, . . . . . | ...                       | 90.                         | 80.7              | 92.                   | 80.1                             | 87.                               | 92.0                                    | ...                                 | ...                                 |
| Nasio-alveolar length, . . . . .                 | 70                        | 67                          | 65                | 74                    | 67                               | 72                                | 69                                      | 72                                  | 66.                                 |
| Maxillary upper facial Index, . . . . .          | 53.8                      | 55.3                        | 46.4              | 52.8                  | 47.5                             | 52.                               | 55.2                                    | ...                                 | ...                                 |
| Nasal height, . . . . .                          | 52                        | 53                          | 52                | 55                    | 54                               | 52                                | 53                                      | 56                                  | 50                                  |
| Nasal width, . . . . .                           | 29                        | 26                          | 29                | 24                    | 26                               | 25                                | 24                                      | 28                                  | 22                                  |
| Nasal Index, . . . . .                           | 55.8                      | 49.1                        | 55.8              | 43.6                  | 48.1                             | 48.2                              | 45.3                                    | 50.                                 | 44.                                 |
| Orbital width, . . . . .                         | 38                        | 36                          | 38                | 38                    | 41                               | 41                                | 38                                      | 41                                  | 39                                  |
| Orbital height, . . . . .                        | 28                        | 30                          | 33                | 31                    | 34                               | 30                                | 33                                      | 34                                  | 31                                  |
| Orbital Index, . . . . .                         | 73.7                      | 83.3                        | 86.8              | 81.6                  | 82.9                             | 73.2                              | 86.8                                    | 82.9                                | 79.5                                |
| Palato-maxillary length, . . . . .               | 59                        | 50                          | 52                | 58                    | 53                               | 58ap                              | 58                                      | ...                                 | 55                                  |
| Palato-maxillary breadth, . . . . .              | 68                        | 61                          | ...               | 68                    | ...                              | 65                                | 62                                      | ...                                 | 63                                  |
| Palato-maxillary Index, . . . . .                | 115.2                     | 122.                        | ...               | 117.2                 | ...                              | 112.                              | 106.8                                   | ...                                 | 114.5                               |
| Lower jaw. { Symphysial height, . . . . .        | ...                       | 24                          | 31                | 38                    | 30                               | 37                                | 35                                      | 30                                  | 34                                  |
| Coronoid, . . . . .                              | ...                       | 54                          | 60                | 65                    | 65                               | 68                                | 71                                      | 63                                  | 60                                  |
| Condylod, . . . . .                              | ...                       | 57                          | 66                | 68                    | 63                               | 71                                | 69                                      | 68                                  | 66                                  |
| Gonio-symphysial length, . . . . .               | ...                       | 80                          | 90                | 85                    | 88                               | 99                                | 95                                      | 83                                  | 81                                  |
| Inter-gonial width, . . . . .                    | ...                       | 96                          | 107               | 105                   | 95                               | 105                               | 88                                      | 98                                  | 87                                  |
| Breadth of ascending<br>ramus, . . . . .         | ...                       | 30                          | 43                | 38                    | 36                               | 47                                | 40                                      | 35                                  | 33                                  |



the floor of the nose by a long ridge; the nasal spine was moderate. The orbital index was mesoseme. The interzygomatic breadth, 140 mm., was a feature in the face, and both the entire facial and upper facial indices were chamæprosopic. The cranial capacity was moderate, 1410 c.c. Owing to the extensive senile obliteration of the sutures, nothing can be said as to Wormian or epipteric bones.

The skull shows no material difference from the Burmese type, so that although a Mahommedan in religion he was probably of the Burmese race.

The skull marked Karen from the jail at Insein was that of a man named Here, aged twenty-three, 5 ft. 1½ in. in height. In the relation of length to breadth it was brachycephalic, and the vertical index was distinctly below the length-breadth index. The outline in the *norma verticalis* was broadly ovoid, and the parieto-occipital slope was not so steep as to suggest artificial flattening in that region. The cranium was moderately capacious, and contained 1420 c.c. The skull was cryptozygous. The forehead was full, sloping moderately backwards, and the glabella and supra-orbital ridges projected very slightly. The nasal bridge was elongated, concave, not depressed at the root, and slightly projecting below; the nose in its proportions was mesorhine. The nasal spine of the superior maxillæ was small, and the incisive region was continued into the floor of the nose by a smooth surface. The basi-nasal and basi-alveolar diameters were equal and the upper jaw was mesognathous. In its dimensions the orbit was microseme. The entire face in the relations of length and breadth was chamæprosopic, but the upper face was leptoprosopic. The interzygomatic breadth, 121 mm., was relatively small. The ossification of the cranium was normal.

So far as a single skull can enable one to express an opinion on the cranial characters of a people, it would appear that the Karens are a brachycephalic race. This view of the proportion of the breadth to the length of the cranium is borne out by two male skulls marked Karen, the measurements of which are recorded in Sir WM. FLOWER'S Catalogue of the Museum of the College of Surgeons. In one the length-breadth index was 82·9, in the other 79·2. It should be stated that in both of these the height of the cranium exceeded the breadth. The mean gnathic index was 98·5.

The collection from Insein contained the skull of a man marked Shan, named Ko Nanda, whose height is given as 5 ft. 5 in. His death was caused by a fracture of the skull. I have also had the opportunity of examining the skull of another Shan named Nga To, said to be twenty-seven years of age, a native of Yunnan, now in Professor Cunningham's Museum. These skulls differed from each other in some particulars. Nanda was brachycephalic, 80·6, without artificial parieto-occipital flattening; Nga To, again, was in the higher term of the mesaticcephalic series. In Nanda the height of the cranium was less than the breadth, but in To the height materially exceeded the breadth. In both skulls the basi-nasal length exceeded the basi-alveolar, and there was no prognathism. In Nanda the glabella and supra-orbital ridges were feeble, and in To moderately projecting; the nasal bridge was concave, elongated, not depressed at the root, and projecting slightly forward below. The nasal

region was generally flattened. In neither specimen was the nose platyrrhine. In Nanda the nasal spine of the superior maxillæ was strong, the incisive fossa was deep and was separated from the floor of the nose by a ridge. In Nanda the index of the entire face was leptoprosopic; in To it was chamæprosopic, and a similar proportion was seen in the upper facial index; but both specimens had great interzygomatic diameter. In both crania the orbital index was mesoseme. As regards the cubic capacity of the crania, Nanda was so much injured that the cubage of the skull could not be taken, but the capacity of To was 1510 c.c.\*

From the relations of length to breadth in the two Shan crania there can be little doubt that these people are in the main brachycephalic, as might have been expected from their Siamese and Chinese affinities.

For purposes of comparison I may refer to four adult male skulls in the Anatomical Museum of the University, which belong to the collection formed by Dr R. BROOM. They are from Bangkok; three are undoubted Siamese, whilst the one lettered A in Table VII. is said to be probably a cross between a Malay and a Siamese.† Their measurements are given in the Table.

All the crania were brachycephalic, both in their general form and numerical proportion; and in three the flattened parieto-occipital region showed evidence of artificial pressure applied during infancy. In each specimen the height was not equal to the breadth. In three specimens the frontal longitudinal arc was longer than either the parietal or occipital. The glabella and supra-orbital ridges were not prominent, and the forehead only slightly receded. The nasal bones had so small a degree of projection that the face was flattened in that region, and the nasal index was mesorhine. The nasal spine of the superior maxillæ was well marked, and the incisive region of the upper jaw was differentiated from the floor of the nose by a ridge. In one specimen the jaw was orthognathic; the others showed to the eye a degree of alveolar prognathism greater than was indicated by the gnathic index. Although in one specimen the complete facial index was 92.8, in the others the face was low, chamæprosopic, a condition which was obviously due to the breadth between the zygomata. The orbital index was variable, and in only two crania the orbits could be regarded as round or megaseme. The palato-alveolar region was either mesuranic or brachyuranic. The mean cubic capacity of the four skulls was 1332 c.c. The teeth were stained with betel-chewing. In two specimens an epipteric bone was present, in one there were two small Wormian bones. One had flat occipital condyles, which were not associated with a third condyle. The palate was highly arched, and the lower jaw was well developed.

In the Barnard Davis Collection, now in the Museum of the Royal College of

\* From the name, Shan Gyi, of one of the men from the jail at Insein (Table VI.), it is possible that he may have been a Shan. It is to be observed that his skull was also brachycephalic. Another skull, that of San Min (Table VI.), described as from the Southern Shan States, was distinctly dolichocephalic, index 74, so that it differed from both the Burmese and Shan type of cranium, and probably belonged to a foreign race.

† A fifth adult specimen is in the collection, but as it has been deformed, apparently from hydrocephalus, the measurements have not been given. Its internal capacity was 1930 c.c.

TABLE VII.

*Siamese.*

|   | Assam.<br>Cross between<br>Siamese and<br>Malay. | Warng. |       |       | Metopic,<br>Hydro-<br>cephalic.      |
|---|--|--------|-------|-------|--------------------------------------|
| Collection (Dr R. Broom), .                               | A.   | B.     | C.    | D.    | Ad.                                  |
| Age, . . . . .  | Ad.  | 31     | Ad.   | Ad.   | M.                                   |
| Sex, . . . . .  | M.   | M.     | M.    | M.    | 1930                                 |
| Cubic capacity, . . . . .                                 | 1330   | 1270   | 1330  | 1400  | Size and<br>proportions<br>abnormal. |
| Glabello-occipital length, . . . . .                      | 168  | 162    | 166   | 173   |                                      |
| Basi-bregmatic height, . . . . .                          | 138  | 131    | 135   | 138   |                                      |
| <i>Vertical Index</i> , . . . . .                         | 82.1   | 80.9   | 81.3  | 79.8  |                                      |
| Minimum frontal diameter, . . . . .                       | 88   | 92     | 98    | 95    |                                      |
| Stephanic diameter, . . . . .                             | 113  | 114    | 111   | 115   |                                      |
| Asterionic . . . . .                                      | 108  | 100    | 108   | 105   |                                      |
| Greatest parieto - squamous<br>breadth, . . . . .         | 139  | 137s.  | 143s. | 144s. |                                      |
| <i>Cephalic Index</i> , . . . . .                         | 82.7   | 84.6   | 86.1  | 83.2  |                                      |
| Horizontal circumference, . . . . .                       | 494  | 484    | 490   | 502   |                                      |
| Frontal longitudinal arc, . . . . .                       | 135  | 127    | 120   | 132   |                                      |
| Parietal . . . . .  | 116  | 123    | 129   | 117   |                                      |
| Occipital . . . . .                                       | 114  | 98     | 95    | 107   |                                      |
| Total . . . . .   | 365  | 348    | 344   | 356   |                                      |
| Vertical transverse arc, . . . . .                        | 305  | 305    | 305   | 311   |                                      |
| Length of foramen magnum, . . . . .                       | 30   | 35     | 36    | 34    |                                      |
| Basi-nasal length, . . . . .                              | 98   | 94     | 101   | 101   |                                      |
| Basi-alveolar length, . . . . .                           | 92   | 93     | 103   | 101   |                                      |
| <i>Gnathic Index</i> , . . . . .                          | 93.9   | 98.9   | 102.  | 100.  |                                      |
| Interzygomatic breadth, . . . . .                         | 128  | 126    | 134   | 138   |                                      |
| Intermalar . . . . .                                      | 118  | 117    | 124   | 125   |                                      |
| Nasio-mental length, . . . . .                            | 113  | 117    | 118   | 118   |                                      |
| <i>Nasio-mental complete facial<br/>Index</i> , . . . . . | 88.2   | 92.8   | 88.   | 85.5  |                                      |
| Nasio-alveolar length, . . . . .                          | 67   | 67     | 66    | 69    |                                      |
| <i>Maxillary upper facial Index</i> , . . . . .           | 52.3   | 53.1   | 49.2  | 50.   |                                      |
| Nasal height, . . . . .                                   | 53   | 52     | 50    | 52    |                                      |
| Nasal width, . . . . .                                    | 26   | 25     | 26    | 26    |                                      |
| <i>Nasal Index</i> , . . . . .                            | 49.1   | 48.2   | 52.   | 50.   |                                      |
| Orbital width, . . . . .                                  | 37   | 40     | 39    | 41    |                                      |
| Orbital height, . . . . .                                 | 34   | 33     | 31    | 37    |                                      |
| <i>Orbital Index</i> , . . . . .                          | 91.9   | 82.5   | 79.5  | 90.2  |                                      |
| Palato-maxillary length, . . . . .                        | 53   | 52     | 55    | 58    |                                      |
| Palato-maxillary breadth, . . . . .                       | 62   | 62     | 66    | 63    |                                      |
| <i>Palato-maxillary Index</i> , . . . . .                 | 116.9  | 119.2  | 120.  | 108.6 |                                      |
| Lower jaw. { Symphysial height, . . . . .                 | 26   | 28     | 31    | 31    |                                      |
| Coronoid . . . . .  | 63   | 68     | 68    | 70    |                                      |
| Condylod . . . . .  | 67   | 68     | 71    | 68    |                                      |
| Gonio-symphysial length, . . . . .                        | 88   | 89     | 95    | 90    |                                      |
| Inter-gonial width, . . . . .                             | 91   | 104    | 99    | 108   |                                      |
| Breadth of ascending<br>ramus, . . . . .                  | 39   | 40     | 44    | 39    |                                      |

Surgeons of England, are several skulls from Siam, which are catalogued by the name Thai.\* Six of the crania ranged in their length-breadth index from 80 to 89, and the mean was 85; they were distinctly brachycephalic. A seventh specimen was dolichocephalic, index 73, which Dr DAVIS ascribes to the sides of the coronal suture having been obliterated: an explanation which does not appear to me to be satisfactory. There can be no doubt that the normal shape of the Siamese skull is brachycephalic.

The University Museum also contains a collection of crania ascribed to natives of China. With the greater number the history supports the view that they are undoubted Chinese, but two or three specimens are uncertain. They are all adults; eleven are male, two female. Their measurements are given in Table VIII.

I do not intend to give a detailed description of this series of skulls. I may, however, state that one skull obtained at Chusan was dolichocephalic (index 74·3), seven were brachycephalic, five were mesaticephalic. Of the latter three had the cephalic index above 77·5; the remaining two, with the index 76·9, had a doubtful history, and, as well as one from Chusan, were possibly not true Chinese. Even if we include all the specimens the cephalic index works out with a mean 81·2, and if the doubtful specimens be excluded, it is a little higher, and the mean of the entire series is brachycephalic. The breadth of the cranium exceeded the height in all but three specimens.

As the lower jaw had not been preserved in the majority of the crania, the complete facial index could only be obtained in three skulls, which were low-faced, chamæprosopic. I have compared these crania, as regards their interzygomatic breadth, with the corresponding dimension in neighbouring Mongolian people, whose skulls approximate in general magnitude, and also with the Esquimaux. From the appended list it will be seen that in this diameter the Chinese face has a less transverse diameter than the Burmese, Shans, Nágás and Esquimaux, though somewhat greater than in the small number of Siamese under examination.

|                     | Number of Skulls. | Sex. | Mean Interzyg. Diam |
|---------------------|-------------------|------|---------------------|
| Chinese, . . .      | 11                | M.   | 132·5               |
| Siamese, . . .      | 4                 | M.   | 131·5               |
| Burmese, . . .      | 38                | M.   | 133·7               |
| Shans, . . .        | 2                 | M.   | 140·5               |
| Chin-Lushais, . . . | 9                 | M.   | 128·8               |
| Nágás, . . .        | 6                 | M.   | 135·3               |
| Esquimaux, . . .    | 18                | M.   | 138·0               |

So far as the degree of prognathism can be determined by the measurements from which the gnathic index is computed the skulls generally were orthognathous, but three were mesognathous. The only prognathic skull was the one found at Chusan with a length-breadth index of 74·3, an additional reason therefore for regarding it as not a genuine Chinaman. As a rule the nose was either mesorhine or leptorhine. Four specimens were platyrrhine, and the Chusan skull was in this category. In six crania

\* *Thesaurus Craniorum*, p. 174. The mean interzygomatic diameter of these crania was 132 mm.

TABLE VIII.

## Chinese.

| Collection, . . .                         | E.U.A.M.* | E.U.A.M.† | E.U.A.M. | E.U.A.M.‡ | E.U.A.M.<br>Hong Kong. | H.T.<br>161 | H.T.<br>163 | H.T.<br>165 | H.T.<br>169 | H.T.<br>170<br>Chusan. | H.T.<br>162 | H.T.<br>162 | H.T.<br>523 |
|---|-----------|-----------|----------|-----------|------------------------|-------------|-------------|-------------|-------------|------------------------|-------------|-------------|-------------|
| Age, . . . . .                            | Ad.       | Ad.       | Ad.      | Ad.       | Ad.                    | Aged.       | Ad.         | Ad.         | Aged.       | Ad.                    | Ad.         | Ad.         | Aged.       |
| Sex, . . . . .                            | M.        | M.        | M.       | M.        | M.                     | M.          | M.          | M.          | M.          | M.                     | M.          | F.          | F.          |
| Cubic capacity, . . .                     | 1320      | ...       | 1370     | 1400      | 1240                   | 1335        | 1590        | 1540        | 1300        | 1330                   | 1340        | 1280        | 1140        |
| Glabello-occipital length, . .            | 175       | 170       | 182      | 175       | 166                    | 167         | 179         | 168         | 170         | 179                    | 168         | 167         | 173         |
| Basi-bregmatic height, . .                | 129       | 136ap.    | 129      | 141       | 134                    | 136         | 144         | 141         | 137         | 126                    | 135         | 129         | 125         |
| Vertical height, . . .                    | 73.7      | 80.       | 70.9     | 80.6      | 80.7                   | 81.4        | 80.4        | 85.9        | 80.6        | 70.4                   | 80.4        | 77.2        | 72.3        |
| Minimum frontal diameter, . . .           | 94        | 100       | 95       | 90        | 90                     | 93          | 92          | 91          | 92          | 86                     | 95          | 86          | 89          |
| Stephanic diameter, . .                   | 109       | 116       | 105      | 107       | 100                    | 105         | 119         | 113         | 112         | 112                    | 116         | 103         | 108         |
| Asterionic " "                            | 114       | 108       | 108      | 111       | 100                    | 107         | 106         | 111         | 116         | 108                    | 104         | 99          | 109         |
| Greatest parieto-squamous breadth, . . .  | 143       | 148       | 140      | 138       | 133                    | 143         | 142         | 150s.       | 148s.       | 133                    | 139         | 132         | 133         |
| Cephalic Index, . . .                     | 81.7      | 87.1      | 76.9     | 78.9      | 80.1                   | 86.6        | 79.3        | 89.3        | 84.1        | 74.3                   | 82.7        | 79.         | 76.9        |
| Horizontal circumference, . .             | 505       | ...       | 510      | 500       | 479                    | 490         | 512         | 503         | 500         | 493                    | 495         | 478         | 485         |
| Frontal longitudinal arc, . .             | 122       | 128       | 127      | 130       | 117                    | 118         | 133         | 128         | 133         | 115                    | 122         | 117         | 124         |
| Parietal " "                              | 123       | 130       | 131      | 130       | 127                    | 120         | 134         | 130         | 113         | 114                    | 122         | 116         | 115         |
| Occipital " "                             | 121       | 114       | 109      | 117       | 104                    | 102         | 115         | 110         | 124         | 130                    | 113         | 116         | 102         |
| Total " "                                 | 366       | 372       | 367      | 377       | 348                    | 340         | 382         | 368         | 370         | 359                    | 357         | 349         | 341         |
| Vertical transverse arc, . .              | 297       | ...       | 289      | 313       | 295                    | 300         | 315         | 317         | 310         | 295                    | 298         | 285         | 291         |
| Length of foramen magnum, . . .           | 30        | ...       | 32       | 36        | 32                     | 35          | 37          | 36          | 30          | 36                     | 35          | 31          | 31          |
| Basi-nasal length, . . .                  | 93        | ...       | 99       | 93        | 98                     | 106         | 99          | 94          | 95          | 96                     | 94          | 93          | 101         |
| Basi-alveolar length, . .                 | 90        | ...       | 100      | 84        | 91                     | 98          | 94          | 93          | 96          | 103                    | 90          | 86          | 94          |
| Gnathic Index, . . .                      | 96.8      | ...       | 101.     | 90.3      | 92.9                   | 92.5        | 94.9        | 98.9        | 101.1       | 107.3                  | 95.7        | 92.5        | 93.1        |
| Interzygomatic breadth, . .               | 132       | 139       | 134      | 128       | 126                    | 141         | 134         | 132         | 124         | 132                    | 136         | 121         | 119         |
| Intermalar " "                            | 117       | 126       | 122      | 118       | 116                    | 129         | 120         | 115         | 113         | 117                    | 121         | 110         | 105         |
| Nasio-mental length, . .                  | 116       | 113.      | ...      | ...       | 114                    | ...         | ...         | ...         | ...         | ...                    | ...         | ...         | ...         |
| Nasio-mental complete facial Index, . . . | 87.8      | 81.2      | ...      | ...       | 90.4                   | ...         | ...         | ...         | ...         | ...                    | ...         | ...         | ...         |
| Nasio-alveolar length, . .                | 73        | 66        | ...      | 71        | 70                     | 70          | 72          | 66          | 66          | 70                     | 67          | 61          | 61          |
| Maxillary upper facial Index, . . .       | 55.3      | 47.4      | ...      | 55.4      | 55.5                   | 49.6        | 53.7        | 50.         | 53.2        | 53.                    | 49.2        | 50.4        | 51.2        |
| Nasal height, . . .                       | 51        | 50        | 47       | 51        | 52                     | 56          | 56          | 53          | 49          | 52                     | 54          | 48          | 46          |
| Nasal width, . . .                        | 24        | 24        | 26       | 24        | 25                     | 26          | 24          | 28          | 26          | 28                     | 26          | 24          | 25          |
| Nasal Index, . . .                        | 47.1      | 48.       | 55.3     | 47.1      | 48.2                   | 46.4        | 42.8        | 52.8        | 53.1        | 53.5                   | 43.1        | 50.         | 54.3        |
| Orbital width, . . .                      | 38        | 38        | 43       | 36        | 40                     | 41          | 37          | 35          | 37          | 37                     | 36          | 33          | 38          |
| Orbital height, . . .                     | 34        | 29        | 33       | 33        | 33                     | 35          | 33          | 35          | 35          | 31                     | 31          | 32          | 32          |
| Orbital Index, . . .                      | 89.6      | 76.3      | 76.7     | 91.7      | 82.5                   | 85.4        | 89.2        | 100.        | 94.6        | 83.8                   | 86.1        | 97.         | 84.2        |
| Palato-maxillary length, . .              | 52        | 53        | 52ap.    | 48        | 47                     | 50          | 56          | 52          | 53          | 57                     | 52          | 45          | 50          |
| Palato-maxillary breadth, . .             | 67        | 67        | 57       | 62        | 60                     | 65          | 64          | 63          | 59          | 67                     | 66          | 59          | 53          |
| Palato-maxillary Index, . .               | 128.8     | 126.4     | 109.6    | 129.      | 127.6                  | 130.        | 114.2       | 121.        | 111.3       | 117.5                  | 126.9       | 131.1       | 106.        |
| Lower jaw. { Symphysial height, . . .     | 39        | 37        | ...      | ...       | 31                     | ...         | ...         | ...         | ...         | ...                    | ...         | ...         | ...         |
| { Coronoid " "                            | 64        | 65        | ...      | ...       | 59                     | ...         | ...         | ...         | ...         | ...                    | ...         | ...         | ...         |
| { Condylod " "                            | 55        | 75        | ...      | ...       | 56                     | ...         | ...         | ...         | ...         | ...                    | ...         | ...         | ...         |
| { Gonio-symphysial length, . . .          | 89        | 92        | ...      | ...       | 86                     | ...         | ...         | ...         | ...         | ...                    | ...         | ...         | ...         |
| { Inter-gonial width, . .                 | 92        | 95        | ...      | ...       | 97                     | ...         | ...         | ...         | ...         | ...                    | ...         | ...         | ...         |
| { Breadth of ascending ramus, . .         | 33        | 37        | ...      | ...       | 34                     | ...         | ...         | ...         | ...         | ...                    | ...         | ...         | ...         |

With skeleton—presented by G. D. Hutchison, Esq.

† Presented by Dr More Reid.

‡ Presented by Professor Greenfield.

the orbit was rounded (megaseme), but in four the transverse diameter so much exceeded the vertical as to place them in the microseme group. In nine specimens the palato-alveolar arch was horseshoe-shaped, brachyuranic; in only two skulls it was elongated so as to be dolichuranic.

In the Chinese the mean cranial capacity of the males was 1376.5 c.c. They approximate closely, therefore, to the Burmese and Siamese in the volume of the cranial cavity.

Since I began, about thirty-five years ago, to collect human crania for purposes of anthropological study, I have endeavoured, as far as possible, to obtain for each skull or group of skulls, a statement of the locality where the specimen was obtained, and of the conditions under which it was got. In a large majority I have found it possible to acquire these particulars, and to speak therefore with some precision of the specimens. When I have resorted to the older collections to which I have had access, not unfrequently I have found a skull catalogued under some general designation, such as from Australia, from India, or from Ceylon, without any attempt being made to specify the exact locality. Such specimens, of course, have not the same value in determining the distribution of the two great groups of dolichocephali and brachycephali.

In all cases, however, the conservator of a museum is dependent on the accuracy of the original collector, and the care with which the specimens have been marked. The series of crania described in this memoir have, with few exceptions, been gathered by members of the medical profession, who have carefully labelled them and given me an account of the locality, and the conditions under which they were collected. We may rely therefore on the specimens as representing, so far as they go, the crania of the people inhabiting the regions in which they were obtained.

It will have been noticed that from time to time in the course of the description, I have referred to the occurrence of crania, brachycephalic in form and proportions, in districts where the skulls are usually dolichocephalic, and conversely of skulls, dolichocephalic in form and proportions, being found in districts where brachycephalic crania are the customary type. The question may, therefore, be very properly considered, in how far the contrasted forms of skulls which we designate by the terms dolichocephalic and brachycephalic, are to be regarded as two distinct race types, or merely extremes, found in the same race, graded into each other by a series of intermediate forms. If the latter proposition be correct they would lose the value which has been assigned to them, since the time of ANDERS RETZIUS, as important guides in the classification of races. In employing these terms it should be understood that I recognise with BROCA and the later school of craniologists a mesaticephalic (mesocephalic) group, as interposed between the more extreme brachycephalic and dolichocephalic forms, and that, to enable a comparison to be made between my observations and those of craniologists generally, the arbitrary numerical division into dolichocephali, with the length-

breadth index below 75, mesaticephali, index from 75 to 80, and brachycephali, index 80 and upwards, has been employed in this memoir. It is obvious that those mesaticephalic skulls which have the length-breadth index below 77.5 approach nearer to the dolichocephali, whilst those with this index above 77.5 approximate to the brachycephali. Thus a skull with the index at or near 76 or 77 is in its form essentially dolichocephalic; whilst one with an index at or near 78 or 79 is essentially brachycephalic, though not falling numerically into this category.

To assist one in determining the value of these classificatory characters as expressing racial distinctions, one should strive to obtain a sufficient number of skulls of a given race, and determine, both by inspection of their form and by actual measurement, how far they fall exclusively either into the brachycephalic or the dolichocephalic group, or present an admixture of both groups, or possess the form and proportion, termed mesaticephalic, *i.e.*, intermediate to the two extremes. One ought not, however, to attach, as is sometimes done, too exclusive an importance in the determination of race characters to the differences expressed by the terms dolichocephalic and brachycephalic; as if those races were necessarily allied to each other, which on the one hand had in common dolichocephalic skulls, or, on the other, heads brachycephalic in form and proportions.\*

RETZIUS himself emphasised also the necessity of the study of the relative projection of the upper jaw, and employed the terms orthognathic and prognathic in his classification of races in accordance with their skull and head-forms. Since his time the relation between the length and breadth of the nose, the breadth and height of the orbit, the breadth and length of the palato-alveolar arch, the breadth and height of the face, the breadth and height of the box of the cranium, as well as its cubic capacity, have all attracted attention. The value of cranial characters as a basis for the classification of races depends therefore upon a comparison not only of the relative length and breadth of the skull or head, but of several other characters. When, with but a slight range of variation, the majority of these characters correspond in a particular tribe or people, they may then properly be considered as the cranial and head characters of the race, and be of value for purposes of classification.

It is not easy at the present time to find a race so pure that the possibility of an intermixture with another race may not at some previous period in the history of the race or the locality have taken place. In using this term 'intermixture' one should understand that it may cover one or other of two conditions. Either it may be produced by the cohabitation of parents of different races, whose offspring would therefore be a half or mixed breed. Or by the residence side by side either, in the same

\* The question of the signification of brachycephaly and dolichocephaly has been discussed in a recent memoir by Dr A. B. Meyer of Dresden, "On the Distribution of the Negritos in the Philippine Islands and elsewhere," and he has arrived at the conclusion that they are not necessarily to be looked upon as constant factors in the determination of racial features. He regards the Negritos and Papuans to be of one race, notwithstanding the differences in the form of the skull and in the stature; so that in his view considerable variability may exist in the physical characters of the same race.

village or in adjacent villages, of individuals or families of, say, two different races, one of which may have reached the place either as captives in war, or as invaders, and the other may represent the aboriginal inhabitants. Skulls collected in such a district would be therefore those of distinct races, and might possess very different forms and proportions, although cohabitation and the production of a mixed breed would also doubtless give rise to a people in which the individuality of the parent types would be lost.

There are, however, certain parts of the globe where, from the climatic conditions, or the geographical position, an almost perfect isolation of the people is possible, and where one may expect to find the race as nearly as possible in its purity.

It is customary, for instance, to speak of the Esquimaux as a dolichocephalic race, and numerous skulls have been measured and recorded in evidence of this character. For my present purpose I may refer to the specimens enumerated and measured in Sir WM. FLOWER's catalogue,\* where the mean cephalic index of twenty-seven crania was 72. Twenty-five of these crania ranged in the length-breadth index from 66.1, the minimum, to 76.6, the maximum, but two specimens were respectively 78.1 and 78.7, i.e., in the higher term of the mesaticephalic group. It is to be noted that both of these were from the eastern side in proximity to Baffin's Bay, where the possibility of the production of a half-breed by intercrossing with a brachycephalic Dane is not unlikely to have occurred.

In the Anatomical Museum of the University of Edinburgh are twenty-two adult Esquimaux crania collected at various places from Greenland to Behring Straits. Eighteen of these had a mean length-breadth index 71.4, and the range was from 69.3 to 75.7; they may all be regarded as essentially dolichocephalic. The remaining four specimens presented different proportions, for the length-breadth indices ranged from 76.2 to 87, so that three were mesaticephalic and one hyper-brachycephalic. A special interest is to be attached to these four crania, as they belonged to the western division of the Esquimaux, and were collected by the late Mr JOHN SIMPSON,† Surgeon to H.M.S. *Plover*, at Point Barrow, Kotzebue Sound, on the American side of Behring Straits. From Mr SIMPSON's description communication takes place yearly with the Asiatic coast by boats, which cross the Straits after mid-summer, and an active trade is carried on between the Esquimaux and the Asiatics. Opportunities are therefore given for an intermixture of the brachycephalic people of Northern Asia with the dolichocephalic Esquimaux, and in this manner a crossing of the two races and the production of half-breed children could without difficulty arise; or some of the Asiatics might, and it is probable do, stay and cohabit with the Esqui-

\* Museum of the Royal College of Surgeons of England, 1879.

† See an excellent description of the locality and people by Mr John Simpson in the *Nautical Magazine*, vol. xxiii. p. 639, 1854. A fifth specimen from the same locality was dolichocephalic, with a length-breadth index 72.7. It is included in the eighteen crania referred to in the text.



maux and be adopted as members of the tribe. One may therefore legitimately draw the conclusion that, as regards the Esquimaux, the occurrence of a brachycephalic cranium or of skulls in the higher terms of the mesaticephalic group may be accounted for by the introduction from without of another race possessing brachycephalic proportions, and not by the evolution within the dolichocephalic Esquimaux of a brachycephalic type.

As regards certain of the other leading characters of the adult crania, it is to be observed that in the dolichocephalic Esquimaux, with few exceptions, the height of the cranium was greater than the breadth; the nasal region was narrow and elongated and well within the leptorhine index, with the exception of one specimen which was mesorhine. The mean gnathic index was 99.5, mesognathous; one specimen only was prognathous; the index variation between 94, the lower, and 104.6, the highest, was 10.6; and twelve out of sixteen specimens ranged only from 97.3 to 101. The skulls therefore showed in these relations a remarkable constancy of type, in harmony with the uniformity in the proportion of the length to the breadth of the cranium.

Another race, from its geographical isolation, and from the number of specimens which I have collected, may also appropriately be considered. I refer to the aborigines of Australia. Several travellers have expressed the opinion that the natives conform to one pattern as regards features, colour of skin, hair and mental characters. The University Museum contains seventy-one adult crania of these people. In almost every instance the locality where the skull was got is known, and the series is representative of all parts of the great island, except the central region. Sixty-nine skulls ranged in their length-breadth index from 61.5 (a specimen elongated from scaphocephaly) to 71.1, and their mean index was 70.2; they were all dolichocephalic both in form and proportion. Of the remaining two skulls, one, a female from West Victoria, had a cephalic index, 77.9; the other a male, from the Thomson River, Queensland, had an index 77.4; both, therefore, were mesaticephalic. Although brachycephalic Malays do, it is said, visit the west coast, and brachycephalic Polynesians may possibly have visited the east coast of Australia, yet in the large series of skulls now before me not a single brachycephalic specimen occurred. There is no evidence therefore of an evolution within the dolichocephalic Australians, or even of the intrusion from without, of a brachycephalic type. As regards the proportions of other parts of the skull, the platyrrhine nasal index, dolichuranic palate, upper jaw either markedly prognathic or mesognathic, and the microcephalic brain cavity are characters which, conjoined with the dolichocephalic cranium, constitute race features of the aboriginal Australians. The relation of the breadth to the height of the cranium is not, as I pointed out in my *Challenger Report* (Part xxix., 1884), constant in the different tribes; for whilst in South Australia, and in some other localities along the southern seaboard, a considerable proportion of the crania possess the basi-bregmatic diameter distinctly below the greatest breadth, in other parts of the island it is altogether exceptional to meet with a skull in which the height is less than the breadth.

From the geographical relations of the hill-tracts in North-Eastern India, occupied by a dolichocephalic people, to the surrounding countries, where the prevailing type of skull is brachycephalic, it seems more reasonable to conclude that the occurrence of exceptional specimens in a district is due to an intermixture of races possessing different head-forms, rather than to the evolution of a new type, on the one hand, in a dolichocephalic race, or, on the other, in a brachycephalic race,—the more so when it is kept in mind that tradition and history point to these countries as having during many centuries been occupied by successive waves of invading people.

## EXPLANATION OF PLATES I.-III.

The figures in these plates are reproductions of photographs kindly taken for me by Mr W. E. Carnegie Dickson, B.Sc.

- FIG. 1. Profile of Skull of Lushai from the north hill tracts. G in Table I.  
 „ 2. Front view of the same skull.  
 „ 3. Profile of skull of Chin. B in Table I.  
 „ 4. Front view of the same skull.  
 „ 5. Profile of skull of Nágá. F in Table II.  
 „ 6. Front view of the same skull.  
 „ 7. Profile of Gurung skull from Nepal. Table II.  
 „ 8. Front view of the same skull.  
 „ 9. Profile of Siamese skull. C, Table VII.  
 „ 10. Profile of Burmese skull, Tun Tha. Table IV.  
 „ 11. Front view of the same skull.  
 „ 12. Profile of Burmese skull, Paudun. Table V.  
 „ 13. Front view of same skull.  
 „ 14. Profile of a Burmese skull from an old cemetery, Upper Burma. Table VI.



**Sir WILLIAM TURNER on "Craniology of People of India."—PLATE I.**



**FIG. 1.—Lushai.**



**FIG. 2.—Lushai.**



**FIG. 3.—Chin.**



**FIG. 4.—Chin.**



Sir WILLIAM TURNER ON "Craniology of People of India."—PLATE II



FIG. 5.—Nāgi.

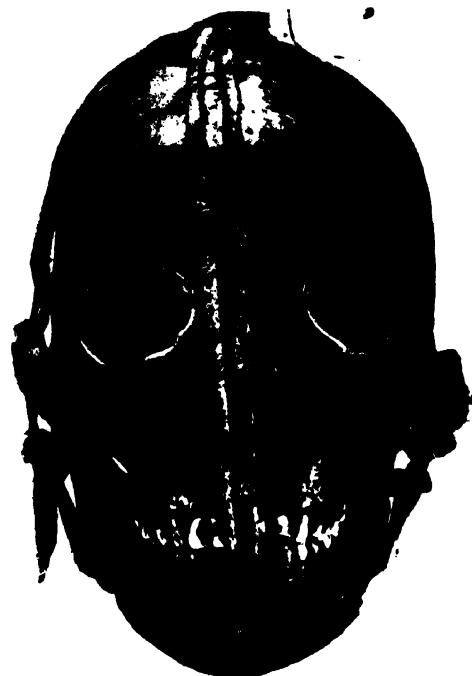


FIG. 6.—Nā



FIG. 9.—Siamese



FIG. 7.—Gurung, Nepal.



FIG. 8.—Gurung, Nepal.



SIR WILLIAM TURNER ON "Craniology of People of India."—PLATE III.



FIG. 10.—Burmese.



FIG. 11.—Burmese.



FIG. 14.—Upper Burma



FIG. 12.—Burmese.



FIG. 13.—Burmese.





**TRANSACTIONS**  
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**CONTRIBUTIONS**  
**TO THE**  
**CRANIOLOGY OF THE PEOPLE OF THE**  
**EMPIRE OF INDIA.**

**PART II.**  
**THE ABORIGINES OF CHŪTA NÁGPŪR AND OF THE CENTRAL**  
**PROVINCES, THE PEOPLE OF ORISSA, THE**  
**VEDDAHS AND NEGRITOS.**

**BY**  
**PROFESSOR SIR WM. TURNER, K.C.B., D.C.L., F.R.S.**

**[WITH FOUR PLATES.]**

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VI.—*Contributions to the Craniology of the People of the Empire of India.*  
Part II. *The Aborigines of Chhṭa Nāgpūr and of the Central Provinces, the People of Orissa, the Veddahs and Negritos.* By Professor Sir WM. TURNER, K.C.B., D.C.L., F.R.S. (With Four Plates.)

(Read July 2, 1900.)

It is my intention in this, the second part of my memoir on the Craniology of the Races of India, to give the results of my examination of skulls obtained from the districts occupied by the aboriginal tribes in Chhṭa Nāgpūr, the Central Provinces, the people in the province of Orissa, and to compare them with the skulls of some other aboriginal people.

The majority of the specimens described belong to the Indian Museum, Calcutta, and through the courtesy of the Trustees I was permitted to have them on loan for purposes of study. Many of these crania had been those of persons who had died in jail. The names, tribes, and castes, and not unfrequently the age, stature, and other physical characters, had been recorded in the prison books, and were embodied in the lists which were sent to me along with the skulls by the authorities of the museum. Several of these skulls were especially interesting, as having been presented to the museum by Colonel DALTON, the author of the valuable treatise on the *Ethnology of Bengal*. Other specimens in the museum had been obtained from the Medical College, Calcutta, and several were presented by Professor D. B. SMITH; in all probability they were from bodies which had been used for anatomical purposes. Mr W. H. P. DRIVER also had presented a series of crania from Ranchi.

In addition, I have received specimens from former students holding appointments in the Indian Medical Service, and I take this opportunity of acknowledging their courtesy in presenting them to me.

The descriptions in this part of my contribution to Indian Craniology are based on the examination of one hundred and one skulls, and the measurements are recorded in the series of Tables.

The works which I have chiefly consulted in drawing up the account of the geographical distribution and tribal characters of the aborigines, are Colonel DALTON's *Descriptive Ethnology of Bengal*, Calcutta, 1872; Sir W. W. HUNTER's *Statistical Account of Bengal* and *Imperial Gazetteer of India*; Sir H. M. ELLIOT's *Memoirs of the Races of the North-West Provinces of India*, edited by JOHN BEAMES, London, 1869; *The Tribes and Castes of Bengal, Ethnographic Glossary, and Anthropometric Data*, Calcutta, 1891, by H. H. RISLEY, I.C.S.; *The Tribes and Castes of the North-Western Provinces and Oudh*, by W. CROOKE, B.A., B.C.S., Calcutta, 1896; "India," by Sir RICHARD TEMPLE in *Chambers's Encyclopædia*; *Census of India, 1891, General Report* by Census Commissioner J. A. BAINES, I.C.S.; *Report on the Lower Provinces*

*of Bengal and their Feudatories*, by C. J. O'DONNELL, M.A., I.C.S.; *Report on the Central Provinces and Feudatories*, by B. ROBERTSON, I.C.S.; *Reports on Anthropology in Bulletin of Madras Government Museum*, Madras, 1897-1900, by EDGAR THURSTON; *The Distribution of the Négritos*, by A. B. MEYER, M.D., Dresden, 1899.

#### ABORIGINES.

Before I enter on the description of the craniological characters of the different aboriginal tribes, it will be useful to say something of the geographical position of the districts in which they live, and of the distribution and physical characteristics of the people of each tribe.

Chúta Nágpúr is a division of Bengal situated to the south of Mirzápur, in the North-West Provinces, and to the north and east of the Central Provinces. It contains, amongst others, the districts of Singbhúm, Manbhúm, Hazáribágh and the tributary state of Sargúja, from all of which skulls had been obtained. In the Lohárdagá district is the town of Ránci, where there is an important jail, from which had been procured the crania of some prisoners who had been executed or had died of disease—many of whom were natives of the adjoining villages. The country is broken up into hills, valleys, and raised plateaux. Hindus form the largest element of the population, but interspersed among them are semi-Hinduised natives and aboriginal tribes.

The Central Provinces are a large territory which extends as far south as the Godavery River, the Nizam's dominions, and the north part of the Madras Presidency. Skulls have been examined from Bastár, Raipur, and other districts in the provinces. The country is diversified and contains tablelands, which in some parts are 2000 feet high, ranges of hills, valleys, and wide plains. The Hindus are the preponderating element amongst the people, but numbers of aborigines are to be found, especially on the Sátúra plateau and in the hill districts of the feudatory state of Bastár.

Orissa is an extensive province on the west side of the Bay of Bengal, and is bounded on the west by Chúta Nágpúr and the Central Provinces. Along the coast line it possesses a border of alluvial land, but the interior is an undulating country intersected by ranges of hills, the highest peaks of which are from 3000 to 4000 feet. Hindus constitute the mass of the people, but the aborigines and semi-Hinduised aboriginal tribes form an important element. Skulls have been obtained from Keunjhar, Kandh-mals, Cuttack, and other parts of Orissa.

In the several provinces under consideration the Hindus occupy and cultivate the valleys and more fertile lands. The aboriginal tribes live in the hills and on the higher plateaux, and preserve more or less completely their religion and tribal customs. Where the Hindus have come into immediate contact with the aborigines, the latter, whilst retaining to some extent their ancient forms of faith and customs, have, in other respects, adopted the Hindu religion and modes of thought.

Writers on the philology and ethnology of the people of India have distinguished, by the names Dravidian and Kolarian, two groups of languages spoken by the aboriginal tribes who occupy the hill ranges in the Central Provinces, Chûta Nágpûr, Orissa, extending also into Western Bengal and Southern India. The name Dravidian was given to the southern of the two linguistic groups by Bishop CALDWELL, and many writers have attached to it an ethnological value. This group of languages is most extensively represented in the Madras Presidency, where it forms the south Dravidian group, known as Telugu, Tamil, Kanarese, and Malayalám; but it also extends into the hill ranges in the Central Provinces and Orissa, as the north Dravidian group spoken by the Gonds, Túlús, Oráons, Kharwárs, Mál-Paháriás, and Kandhs. The Kolarian group of languages, as it has been named by Sir GEORGE CAMPBELL,\* prevails amongst the tribes which lie to the north of those who speak Dravidian, and who occupy the hill tracts of Western Bengal and Central India. The Santals, Múndas, Hos, Kols, Korwás, and Bhils are the principal tribes to employ the languages of this group. It by no means, however, follows that tribes speaking a Kolarian dialect are ethnically distinct from those who speak Dravidian, as it is not uncommon to find that a tribe possessing the physical characteristics of the Dravidians is classed linguistically as Kolarian. The division, therefore, into these two linguistic groups has a philological rather than an ethnological significance. Dravidian dialects are apparently spoken by about one-fifth of the population of India; Kolarian by about one-tenth.

*Gond.* TABLE I.

These people are regarded on linguistic grounds as Dravidian. They inhabit an extensive tract of country formerly known as Gondwáná, which extended from the Vindhyan mountains to the Godavery, and which now constitutes a large part of the Central Provinces. They are found also in the southern part of Chûta Nágpûr and a small number in Orissa. They occupy the tableland of Sâtpurá and the hill country from Mandla to Asirgarh, as well as Koreá, Sirgúja, and Udaipur. They were a brave and independent people before the rise of the Mogul Empire. Whilst some still retain their independence and original faith, others have been subjugated and have become either Hinduised or Mahomedans. Colonel DALTON considers the Márias who inhabit dense jungles in Bastár, Chanda, and other southern dependencies to be the best type of the primitive aboriginal Gond.† Along with the Rev. G. HISLOP, he describes the wild Gonds as having flat noses, distended nostrils, thick lips, dark skin, scanty beard and moustache, and straight, black hair; sometimes the hair is said to be short, crisp, and curly, but quite distinct from the woolly hair of the negro. In some instances the head is shaved, leaving only a top-knot, but more frequently the hair is matted and

\* Races of India. *Journ. Ethno. Soc.*, London. N.S. Vol. I. p. 130, 1869.

† See also Chanda Settlement Report; Colonel Glasfurd's Report on Bastár; Mr Robertson's Census Report, 1891.

untidy. The Gonds are about the same height as the Márias and Bhatras, but are larger and heavier in build than the Oráons or Kols. They are scantily clothed and the women are tattooed. The dead are cremated and the ashes are then buried, but it is said that the women and children are buried without being cremated. The grave is dug so that the head lies to the south and the feet to the north. In character, the Gonds are reserved, sullen, and suspicious, and the Márias are a shy, timid people. They are totemistic and exogamous. They practise both infant and adult marriage, and widows remarry. The unmarried young men sleep in a common dormitory, and in some villages there is a similar provision for the unmarried young women. DALTON says that they are indifferent cultivators, and careless about the appearance of their houses. The Gonds, who are not Hinduised, worship their own deities and the spirits of the forests in which they live. From the *Census Report* of 1891, it would appear that 1,379,580 people were returned as speaking the Gond branch of the northern Dravidian group of languages, though the actual numerical strength of the Gonds is said to be 2,897,591.

The Edinburgh University Anatomical Museum contains four skulls of Gonds from the Godavery district, though the exact locality is not known. They had originally been in the collection of the late Dr HANDYSIDE, and were marked "wild tribes called Göttech or Gōnd, from Godavery district of Central India." They were all adults, though the wisdom teeth were not erupted in D; three were presumably males and one a female.

*Norma Verticalis*.—The crania had a marked family likeness. They were elongated, narrow, with vertical sides, and dolichocephalic in form and proportions. In the males the parietal eminences were feeble, in the female (C) they were more projecting and gave greater relative breadth to the cranium. In both sexes they were situated considerably in front of the occipital point. The vault of the skull was somewhat roof-shaped, but not ridged in the sagittal line. The skulls were cryptozygous or nearly so. In three specimens the stephanic diameter was greater than the asterionic.

*Norma Lateralis*.—The skulls rested behind on the cerebellar part of the occiput. The glabella and supra-orbital ridges, although visible, were not prominent even in the men. The forehead in the males only slightly receded; in the female it bulged slightly forward. The antero-posterior curve of the cranial vault rose gently to the vertex, and from the obelion it sloped downwards and backwards into the occipital squama, which projected behind the inion. There was no sign of parieto-occipital flattening. The frontal longitudinal arc in each skull was slightly less than the parietal, but always considerably in excess of the occipital arc.

The nasal bones were of moderate size, with the bridge not prominent and concave forwards; the fronto-nasal suture was not depressed, and the nasal spine of the superior maxillæ was moderate. The junction of the side walls and floor of the anterior nares was rounded, and in three specimens the floor of the nose was separated from the incisive region of the maxilla by a low ridge. The canine and incisor fossæ were of

moderate depth. The teeth were fully erupted except in D, in which the wisdoms had not appeared, and they were in good order except in B, in which the crowns were much worn. No skull was metopic, but the other cranial sutures were distinct and denticulated. In two skulls Wormian bones were in the lambdoidal suture, and in one also in the parieto-mastoid suture. In all, the ali-sphenoid and parietal articulated at the pterion, but in C the junction was very narrow; in B a very small epipteric bone was present in the suture. The muscular ridges and processes were not strong except in A. No skull had a 3rd occipital condyle or an exostosis in the external auditory meatus, or a subdivision of the malar bone. One skull had a pair of short para-mastoid processes: two had infra-orbital sutures. The interzygomatic breadth of the face invariably exceeded the intermalar, stephanic, and asterionic breadth; in A the interzygomatic breadth was slightly in excess of the parieto-squamous, and in B they were almost equal.

The lower jaw was moderate in size and with a deep symphysis in B; the chin was prominent; the coronoid height did not greatly exceed the condyloid. The intergonial width and gonio-symphysial length closely approximated to each other.

The mean cephalic index was 71.2 and the range of variation was from 69.4 to 75. The crania were therefore dolichocephalic. The greatest length of the crania ranged from 176 to 180 mm., and the mean was 177.5; the greatest breadth ranged from 123 to 132 mm., and the mean was 126.5. The vertical index was 76, and the range of variation was from 74.6 to 77.2. The crania were metriocephalic. The actual height of the skulls ranged from 132 to 139 mm., and the mean was 135. In each skull the basi-bregmatic height was greater than the parieto-squamous breadth.

The nasio-mental length ranged from 98 to 112 mm., with a mean of 104 mm.; the interzygomatic breadth ranged from 118 to 128 mm., with a mean of 121.5. The complete facial index ranged from 79.7 to 91.8, with a mean of 84.8; the skulls, therefore, were chamæprosopic or low-faced. The maxillary or upper facial index ranged from 46.9 to 53.4, with a mean of 50.2; in the proportion of its upper region, the face was in the lowest term of the leptoprosopic group.

The mean gnathic index was 99.8, and the range of variation was from 96.9 to 104.4; the skulls, therefore, on the average, were mesognathous, though one was orthognathous and another prognathous. The mean nasal index was 53.4, and the range of variation was from 48.9 to 56.8; though the mean was just within the platy-rhine group, two of the crania were mesorhine. The mean orbital index was 83, and the range of variation was from 81.1 to 83.8. All the orbits were microseme. The mean palato-maxillary index was 114.5, and the range of variation was from 105.3 to 122; the greatest palato-maxillary length was 56 mm. and the greatest breadth was 61 mm.; the skulls were in the mean mesuranic, though one was dolichuranic and two brachyuranic.

The mean cubic capacity of the four crania was 1274.5 cub. cent., i.e., microcephalic, to which category each cranium belonged.



TABLE I.  
*Dravidian Tribes.*

|  | Gond.    |       |       |       | Orion.                   |                          |                  | Paharia,<br>Birbhūm. |         | Kharwar<br>Bogta. | Kandh.                               |          |
|--|----------|-------|-------|-------|--------------------------|--------------------------|------------------|----------------------|---------|-------------------|--------------------------------------|----------|
|  |          |       |       |       | Sonva,<br>Konka Village. | Jura,<br>Lalpur Village. | Chandoa Village. | Rampoojar.           | Dhobia. | Bahadur.          | Judisther-Jani,<br>Bhatpara, Orissa. |          |
|  | E.U.A.M. |       |       |       | I.M.                     | I.M.                     | I.M.             | I.M.                 | I.M.    | I.M.              | I.M.                                 | E.U.A.M. |
| Collection number, . . .                     | A.       | B.    | C.    | D.    | 608                      | 610                      | 601              | 559                  | 558     | 551               | 556                                  |          |
| Age, . . . . .                               | Ad.      | Ad.   | Ad.   | Ad.   | Ad.                      | Ad.                      | Ad.              | 50                   | Aged.   | 29                | Ad.                                  | 25       |
| Sex, . . . . .                               | M.       | M.    | F.    | M.    | M.                       | M.                       | F. (?)           | M.                   | M.      | M.                | F.                                   | M.       |
| Cubic capacity, . . . . .                    | 1238     | 1250  | 1295  | 1315  | 1420                     | 1430                     | 1250             | 1246                 | 1206    | 1305              | 1070                                 | 1325     |
| Glabello-occipital length, . . . . .         | 180      | 177   | 176   | 177   | 186                      | 189                      | 175              | 176                  | 178     | 175               | 158                                  | 172      |
| Basi-bregmatic height, . . . . .             | 139      | 132   | 134   | 135   | 130                      | 136                      | 127              | 124                  | 128     | 128               | 123                                  | 140      |
| Vertical Index, . . . . .                    | 77.2     | 74.6  | 76.1  | 76.3  | 69.9                     | 72.                      | 72.6             | 70.5                 | 71.9    | 73.1              | 77.4                                 | 81.4     |
| Minimum frontal diameter, . . . . .          | 92       | 92    | 91    | 89    | 91                       | 90                       | 92               | 88                   | 91      | 85                | 92                                   | 92       |
| Stephanic, . . . . .                         | 110      | 110   | 105   | 101   | 104                      | 104                      | 105              | 102                  | 102     | 101               | 115                                  | 106      |
| Asterionic, . . . . .                        | 102      | 101   | 100   | 103   | 103                      | 106                      | 104              | 108                  | 108     | 104               | 90                                   | 106      |
| Greatest parieto-squamous breadth, . . . . . | 125p.    | 123s. | 132p. | 126p. | 132s.                    | 129s.                    | 132p.            | 135s.                | 128s.   | 128s.             | 133p.                                | 135s.    |
| Cephalic Index, . . . . .                    | 69.4     | 69.5  | 75.0  | 71.2  | 71.                      | 68.3                     | 75.4             | 76.7                 | 71.9    | 73.1              | 84.2                                 | 78.5     |
| Horizontal circumference, . . . . .          | 500      | 493   | 488   | 488   | 503                      | 518                      | 480              | 497                  | 498     | 490               | 463                                  | 483      |
| Frontal longitudinal arc, . . . . .          | 135      | 132   | 130   | 130   | 130                      | 128                      | 118              | 127                  | 118     | 123               | 110                                  | 119      |
| Parietal " " . . . . .                       | 140      | 243   | 132   | 131   | 126                      | 147                      | 234              | 118                  | 130     | 124               | 127                                  | 120      |
| Occipital " " . . . . .                      | 103      |       | 108   | 114   | 121                      | 110                      |                  | 109                  | 112     | 115               | 105                                  | 119      |
| Total " " . . . . .                          | 378      | 375   | 370   | 375   | 377                      | 385                      | 352              | 354                  | 360     | 362               | 342                                  | 358      |
| Vertical transverse arc, . . . . .           | 298      | 298   | 298   | 299   | 305                      | 304                      | 290              | 292                  | 280     | 294               | 287                                  | 296      |
| Length of foramen magnum, . . . . .          | 29       | 34    | 32    | 33    | 30                       | 35                       | 33               | 35                   | 33      | 37                | 28                                   | 37       |
| Basi-nasal length, . . . . .                 | 104      | 91    | 95    | 97    | 103                      | 101                      | 95               | 96                   | 98      | 91                | 88                                   | 99       |
| Basi-alveolar length, . . . . .              | 102      | 95    | 95    | 94    | 98                       | ...                      | 91               | 95                   | ...     | 84                | 89                                   | 95       |
| Gnathic Index, . . . . .                     | 98.1     | 104.4 | 100.  | 96.9  | 95.1                     | ...                      | 95.8             | 99.                  | ...     | 92.3              | 101.1                                | 96.      |
| Interzygomatic breadth, . . . . .            | 128      | 122   | 118   | 118   | 127                      | 130                      | 123              | 129                  | 134     | 121               | 115                                  | 128      |
| Intermalar " " . . . . .                     | 117      | 113   | 109   | 109   | 115                      | 124                      | 108              | 111                  | 124     | 112               | 106                                  | 116      |
| Nasio-mental length, . . . . .               | 102      | 112   | ...   | 98    | 108                      | 126                      | ...              | ...                  | ...     | 107               | ...                                  | 108      |
| Nasio-alveolar " " . . . . .                 | 60       | 64    | 63    | 57    | 64                       | ...                      | 61               | 64                   | ...     | 62                | 51                                   | 64       |
| Complete Facial Index, . . . . .             | 79.7     | 91.8  | ...   | 83.   | 85.                      | 96                       | ...              | ...                  | ...     | 88.               | ...                                  | 84.3     |
| Nasal height, . . . . .                      | 47       | 46    | 44    | 43    | 48                       | 50                       | 46               | 48                   | 45      | 47                | 37                                   | 47       |
| Nasal width, . . . . .                       | 23       | 24    | 25    | 24    | 26                       | 27                       | 22               | 25                   | 26      | 23                | 25                                   | 25       |
| Nasal Index, . . . . .                       | 48.9     | 52.2  | 56.8  | 55.8  | 54.2                     | 54.                      | 47.8             | 52.1                 | 57.8    | 48.9              | 67.6                                 | 53.2     |
| Orbital width, . . . . .                     | 36       | 37    | 37    | 37    | 37                       | 37                       | 36               | 39                   | 41      | 38                | 35                                   | 40       |
| Orbital height, . . . . .                    | 30       | 30    | 31    | 31    | 31                       | 33                       | 30               | 32                   | 31      | 35                | 27                                   | 32       |
| Orbital Index, . . . . .                     | 83.3     | 81.1  | 83.8  | 83.8  | 83.8                     | 89.2                     | 83.3             | 82.                  | 75.6    | 92.1              | 77.1                                 | 80.      |
| Palato-maxillary length, . . . . .           | 55       | 56    | 50    | 50    | 52                       | ...                      | 48               | 51                   | ...     | 49                | 50                                   | 52       |
| Palato-maxillary breadth, . . . . .          | 61       | 59    | 61    | 60    | 67                       | 72                       | 55               | ...                  | ...     | 65                | 60                                   | 68       |
| Palato-maxillary Index, . . . . .            | 110.9    | 105.3 | 122.  | 120.  | 128.8                    | ...                      | 114.5            | ...                  | ...     | 132.6             | 120.                                 | 130.7    |
| Lower jaw. { Symphysial height, . . . . .    | 29       | 35    | ...   | 28    | 27                       | ...                      | ...              | ...                  | ...     | 27                | ...                                  | 33       |
| Coronoid " " . . . . .                       | 69       | 63    | ...   | 55    | 57                       | 72                       | ...              | 54                   | ...     | 53                | ...                                  | 62       |
| Condylod " " . . . . .                       | 60       | 61    | ...   | 53    | 60                       | 67                       | ...              | 59                   | ...     | 50                | ...                                  | 61       |
| Gonio-symphysial length, . . . . .           | 88       | 87    | ...   | 84    | 80                       | 90                       | ...              | 77                   | ...     | 78                | ...                                  | 81       |
| Inter-gonial width, outside, . . . . .       | 89       | 87    | ...   | 79    | 89                       | 106                      | ...              | 86                   | ...     | 89                | ...                                  | 100      |
| Breadth of ascending ramus, . . . . .        | 32       | 32    | ...   | 31    | 33                       | 34                       | ...              | 30                   | ...     | 27                | ...                                  | 35       |

NOTE.—In the Tables, as in Part I, I.M. signifies Indian Museum; E.U.A.M., Edinburgh University Anatomical Museum; H.T., Henderson Trust-Collection; T.C.D., Trinity College, Dublin.

*Oráon.* TABLE I.

The Oráons, or Uráons, are a Dravidian tribe in Chúta Nágpúr, especially in the tributary states of Sirgúja and Jashpúr, but scattered also in Singbhúm, Manbhúm, and Hazáribágh. The tradition in the tribe is that they migrated from the west coast of India. DALTON states that the skin is a dark brown approaching black; the hair is long, black, coarse, and inclined to be frizzy; the jaws are projecting; the lips are thick; the forehead is low, narrow, and not receding; the eyes are bright but not oblique; the expression is pleasing; and the upper face displays intelligence. DALTON gives the height of a young man as 5 feet 2 inches, and that of four girls between 12 and 16 years as ranging from 4 feet 7½ inches to 5 feet ½ inch. The dress of the men is a long strip of cloth adjusted about the middle of the body, but giving free play to the limbs, and a girdle of cord is about the waist. The hair is gathered into a knot at the back of the head, in the knot are combs and ornaments of brass and glass; bright brass chains dangle from the ears. The women wear a waist-cloth, and when more civilised, a cotton dress, and ornament themselves with beads and copper or brass rings. They have tattoo marks on the brow and temple, and on the arms and back. The unmarried men sleep in a bachelor house, the Dhúmkúria, and it is probable that the young women have a similar arrangement. Adult marriage is practised, and widows may remarry. The dead are cremated, and the ashes are collected in an earthen vessel, which for a time is suspended to a post in front of the house of the deceased, but is subsequently buried. They eat flesh as well as vegetables. They worship a supreme being as represented by the sun. In the General Report on the Census of India, 1891, it is stated that 368,222 speak the tribal language, but that the numerical strength of the Oráons is 523,258.

Three skulls in the Indian Museum, obtained from the neighbourhood of Ranchi, are marked Oráon or Uráon: No. 601, from the village of Chandoa, 30 miles from Ranchi; No. 606 from Konka village; and No. 610 marked Jura from Lalpur village. They were presented by Mr W. H. P. DRIVER. They are all adult; I regarded two as males, but the sex of the skull from Chandoa was more doubtful.

In their general form they were elongated and ovoid, and with vertical sides, and resembled in general form the skulls of the Múnda race, also from Ranchi, to be described in a subsequent section. One was hyper-dolichocephalic, and the parietal longitudinal arc greatly exceeded the frontal and occipital; another was dolichocephalic with the frontal arc a little the longest; the third slightly exceeded the upper numerical limit of the dolichocephalic, and in it the parietal and occipital arcs could not be properly differentiated. In two specimens the basi-bregmatic diameter was less than the parieto-squamous, but in the hyper-dolichocephalic skull it was greater. The face was orthognathous. In two specimens the nose was platyrrhine; in the third it was leptorrhine. In two skulls the orbital proportions were microseme, in the third just within

the megaseme group. The palato-maxillary index in one was mesuranic, in another brachyuranic. The face in one was chamæprosopic, in the other leptoprosopic. In the two males the mean capacity of the cranium was relatively high for an aboriginal race, viz., 1425 c.c. ; in the possible female skull the capacity was 1250 c.c.

*Málé Paháriá or Hillmen of Rájmahál.* TABLE I.

DALTON, in the *Ethnology of Bengal*, devotes a section in his chapter on the Dravidian tribes to the aborigines who inhabit the Rájmahál Hills. This range extends from the banks of the Ganges to the Bráhmāni river and the boundary of the Bírbehú district, and is in the Santál Parganá district of Bengal. He also states that in the Rámgarh Hills of the Bírbehú district, and at the foot of the Rájmahál Hills, are villages occupied by a tribe who call themselves Mál-Paháriás,—the precise affinities of which it is somewhat difficult to determine. As two skulls of aborigines marked Paháriás from Bírbehú have come under my observation, it is convenient, from their possible Dravidian affinities, to consider them in this section. The Málers are short in stature, face oval, nose not prominent but broad below, and with the nares circular rather than elliptical ; lips full, eyes not oblique. They dress as well as the peasants of the plains, and the women wear a white skirt, a gay coloured square of silk over the right shoulder and tied under the left arm. The hair is collected into a knot behind the head, with two long locks hanging over the ears. They are apparently exogamous. Marriage is either infant or adult, and widows can remarry. A special house is provided for the bachelors, and another for the unmarried girls. They worship the sun and their ancestors, and believe in the transmigration of souls. The dead are sometimes buried, though, Mr RISLEY says, more usually cremated. They are hunters, but they also practise jhúm cultivation. They eat flesh as well as vegetables, and drink a fermented liquor. The numerical strength of the tribe is said to be 18,506, though 30,838 use the tribal language.

In the collection in the Indian Museum are the skulls of two men, Nos. 558, 559, from Bírbehú, both of whom had died in the prison hospital. No. 558, marked Dhobia Paháriá, was that of a man said to be 80 years old, with an edentulous upper jaw ; he had sustained a comminuted fracture of the frontal bone, the pieces of which had subsequently united. No. 559, also marked Paháriá, was named Rampoojar, and aged 50.

The skulls were not roof-shaped, but were somewhat flattened at the vertex, and the outline was ovoid in the *norma verticalis*, though the cranium in one was not specially elongated, and the side walls bulged somewhat in the squamous region. In No. 558 the length-breadth index was 71·9, dolichocephalic, and the parietal longitudinal arc greatly exceeded both the frontal and occipital ; the vertical index corresponded with the cephalic. In No. 559 the length-breadth index was 76·7 in the lower term of the mesaticephalic group ; in this skull the frontal longitudinal arc greatly exceeded

the parietal and occipital ; the vertical index was much below the cephalic. The glabella and supra-orbital ridges were more prominent in the aged than in the younger man. In both the forehead slightly receded. In the old skull the parieto-occipital region was asymmetrical as if from artificial pressure, but in the other it had a gentle slope backwards. The nasion was not depressed, and the bridge of the nose, concave from above downwards, was distinct, though less so in the old man. The nose was platyrrhine in the old skull, 57·8, and nearly so in the adult—viz., 52·1, in which also the upper jaw was mesognathous. In both the orbital index was mesoseme. The muscular ridges were stronger in the aged skull, which was markedly phænozygous, and wide both in the interzygomatic and intermalar diameters ; it rested behind on the mastoids. The adult cranium was nearly cryptozygous, and rested behind on the occipital bone. In both the cubic capacity was small, the mean of the two being 1226 c.c.

*Kharwár.* TABLE I.

In Chúta Nágpúr and Southern Behar is a non-Aryan tribe named Kharwár, who speak a Kolarian tongue. The Bhogtas are the most important division of the tribe. DALTON states that the Kharwárs are mixed up with the Cheros, living in the same district, with whom they claim affinity. Both have become proselytes to Hinduism. When visited in 1794 by Captain J. T. BLUNT, they were seen to be nearly naked, and armed with bows, arrows, and hatchets. BUCHANAN found that whilst some were land-owners and others labourers, there were others again who were obviously primitive in habits, and represented the aboriginal inhabitants. The low Kharwárs are said by DALTON to resemble strongly the Santals. The skin was very dark, nose low and pyramidal-shaped, lips thick and protuberant, zygomata so prominent that the temples were hollow. Another observer says that the hair was black and straight. The facial type is much more refined in the land-owning class, owing to intermarriage with high castes. The women are tattooed as in other Dravidian tribes. The Kharwárs are totemistic, and marriage within the same sect is forbidden. They have in a large measure adopted the Hindu practice of infant marriage ; in the more primitive tribes the marriage of widows is permitted. Some of the clans continue to offer sacrifices to spirits. They practise cremation, and throw the ashes into a running stream. They will not eat flesh, but cultivate the soil for grain. According to the Census Report for 1891, their numerical strength was 112,298, but only 7651 spoke the tribal language.

The Indian Museum contains a skull, No. 551, of a man named Bahadur of the Bhogta division of the Kharwár tribe. He came from Gola, Hazáribágh, Chúta Nágpúr. He was reported as 29 years old, 5 feet 0·5 inch high ; eyes brown, not very almond shaped ; beard very scanty, slight moustache, no whiskers ; lips everted ; nose pyramidal ; cheek bones prominent. He died of phthisis, and is said to have been a poor example of his race. The skull was presented by Dr J. Wood.

The cranium was an elongated ovoid, though the sides were not so vertical as in many dolichocephalic skulls of the aborigines; the parieto-squamous diameter was considerably greater than the stephanic; a low sagittal ridge was associated with a moderate slope outwards to the parietal eminences. The length-breadth index, 73·1, was dolichocephalic, and the frontal and parietal longitudinal arcs were almost of the same length; the breadth and height were equal. The forehead was retreating; the glabella and supra-orbital ridges were moderate. The slope downwards from the obelion was steeper than in the more dolichocephalic crania; the occipital squama was prominent and projected behind the inion. The nasion was not depressed; the bridge of the nose was sharp and laterally compressed; the nasal spine of the superior maxillæ was strong, and a sharp ridge separated the floor of the nose from the incisive region of the jaw. The nasal index, 48·9, was almost leptorhine, and the gnathic index, 92·3, was orthognathic. The orbital index, 92·1, showed the height of the orbit to be almost equal to its breadth; the palato-alveolar arch, 132·6, was strongly brachyuranic. In its complete facial index, 88, the face was chamæprosopic. The upper wisdom teeth were fully erupted, the lower were appearing; the upper incisive fossæ were deep. The skull was not metopic; there were no Wormian bones. A small epipteric bone was in the left pterion. The hard palate was strongly arched; the occipital condyles were flattened; the left jugular foramen was partially blocked by a growth from the petrous-temporal; the left jugal process was tuberculated. The lower jaw was feeble. The skull was cryptozygous, and rested behind on its lower occipital surface. The cubic capacity was 1305 c.c., and the cranium was microcephalic.

#### *Kandh.* TABLE I.

The Kandhs, Kondhs, or Khonds are regarded as Dravidians. The name signifies mountaineer, and they constitute one of the most important aboriginal tribes in Orissa, where they occupy an elevated plateau, intersected by ranges of hills called Kandhmals; but they are also scattered through the tributary states of Orissa. An interesting account of the people and their customs has been given both by Major MACPHERSON and by Colonel DALTON. The latter writer states that the men are physically a fine race, more so than the Gonds, Bhuiyás, and Páns. They are as tall as the average Hindu, and not much darker in complexion. He regards them as a mixed race, a blend of the Kol, Gond, and Aryan. They worship their own deities, one of the most important being the earth-god or goddess. They are an agricultural people, and before they came under British influence they made human sacrifices to the earth-goddess, and practised female infanticide. Their clothing is scanty, and consists of a waistcloth passed between the thighs. The long hair is tied into a horn-like projection between the eyes. The cheeks and forehead are tattooed. The Kandhs practise cremation. The unmarried young men have a common dormitory, and the girls also have a house assigned to them. Marriage is between adults, and not during infancy; widows may

remarry. They are inveterate drunkards. In the Census Report for 1891, 627,388 persons are returned as Kandhs, though only 320,071 speak the tribal language.

I have had the opportunity of examining two skulls said to be those of Kandhs. One was presented to me by a former pupil, now Major WM. B. BANNERMAN, M.D. It was that of a man named Judisther Jani, an inhabitant of the village of Bhatpara, in the Khonda subdivision of the commissionership of Orissa. The man had been hanged for murder in the jail at Cuttack. Another specimen, No. 556, in the Indian Museum, was presented by Dr W. D. STEWART, and was obtained from the Kandhmals. It was that of a woman said to be 18 years old, and 5 feet 1 inch in stature.

The male skull was that of an adult. The teeth were more worn in the upper jaw than in the lower. The sutures were unossified, and if it had not been for the worn condition of the molars, one would have regarded the man as about 30 years of age.

In the *norma verticalis* the skull was broadly ovoid with no sagittal ridge, and with a moderate slope from the suture to the parietal eminences. In the proportion of length and breadth the cranium was mesaticephalic, 78·5, and nearer therefore to the brachycephalic than the dolichocephalic standard. The parietal arc was only 1 mm. longer than either the frontal or occipital. The height was greater than the breadth, and the vertical index was 81·4, akrocephalic.

In the *norma lateralis* the glabella and supra-orbital ridges were moderate, the forehead was slightly receding, the vertex was moderately arched, and the slope backwards into the occipital squama was gentle. A slight want of symmetry was noticed in the occipital squama, but not sufficient to lead one to infer that there had been intentional parieto-occipital flattening. The skull was cryptozygous, and rested behind on the occipital condyles. The nasion was not depressed; the nasal bones were slender, and the osseous bridge was depressed and slightly concave. The nasal spine of the superior maxillæ was moderate, and the floor of the nose passed into the incisive region of the upper jaw without the interposition of a dividing ridge. The upper jaw was orthognathic. The complete facial index was 84·3,—i.e., chamæprosopic; the nasal index was platyrrhine, and the orbital index was microseme. The palate was remarkably deep and brachyuranic. The lower jaw was well formed and with a strong chin. A large epipteric bone was in each pterion. The cubic capacity of the cranium was microcephalic, 1325 c.c.

The female skull, No. 556, from the Kandhmals, was that of a young woman, and the wisdom teeth were not erupted. A slight transverse constriction was seen behind the coronal suture. Its breadth was great in relation to the length. The parieto-occipital region was steepish but not flattened; the cephalic index, 84·2, placed it amongst the brachycephalic. The parietal arc was much longer than either the frontal or occipital. The vertex was flattened; the frontal and parietal eminences were prominent, the forehead was vertical, all of which are sexual characters. The height was considerably below the breadth, and the vertical index was 77·4. The bridge of the

nose was wide and flattened; the anterior nares were wide and rounded at the junction of the side walls with the floor; the nasal index was strongly platyrrhine. The upper jaw was mesognathous, the orbital index was microseme, and the palate was brachyuranic. The cranial capacity was only 1070 c.c. The skull was cryptozygous.

*Nágesar or Kisán.* TABLE II.

The Nágesars are a Dravidian tribe found in Sirgúja, Jashpúr, Palámau, and Lohárdagá in Chúta Nágpúr. DALTON says that in appearance they resemble the Kols, but not the best type, the Santal rather than the Ho. They are not, however, marked with a *godna* or arrow, and the women are not tattooed. DALTON describes them as ill-favoured, the forehead receding, narrow and low; the nose short, broad at the base and with a truncated appearance; the front teeth and jaws project, tilt up the lip and the end of the nose, and give a prognathic character. The skin is deep brown to black; the stature is short. They are totemistic and practise adult marriage. They offer sacrifices to the sun and other deities, but many of them worship the tiger—like the Santals—and they also adore their ancestors.

The Indian Museum contains the skull (No. 405) of a man æt. 30, of the Nágesar tribe from Chúta Nágpúr. He was a Dacoit named Lukroo, who died in prison. The skull was presented by Lieut.-Col. DALTON.

The cranium in the *norma verticalis* was an elongated ovoid with vertical sides, a ridge-like sagittal region with a steep slope downwards and outwards to the parietal eminences. The cephalic index was only 67·8, and the skull was hyper-dolichocephalic. The basi-bregmatic height materially exceeded the breadth, and the vertical index was 73·3. The glabella and supra-orbital ridges were moderate; the forehead somewhat receded; the parieto-occipital region sloped gradually backwards; the occipital squama was rounded and projected behind the inion. The nasion was shallow; the bridge of the nose was almost vertical and inclined to be flattened; the nasal spine of the superior maxillæ was feeble, and the anterior nares rounded off into the incisive region of the upper jaw. The nasal index, 53·2, was platyrrhine, but the gnathic index, 96·9, was orthognathous. The complete facial index was 80·6, *i.e.*, low-faced or chamæprosopic. The height of the orbit was materially below the breadth, and the index, 84·2, placed the orbit almost in the microseme group. The palato-maxillary index, 111·1, was almost dolichuranic. The teeth were fully erupted and showed signs of wear; the canine fossæ were deep. The skull was not metopic, and the other sutures were not ossified; a small inter-parietal bone and smaller Wormian bones were in the lambdoid region. In the left pterion were two epipteretic bones, and the right alisphenoid was pointed. The os planum of the ethmoid was pointed in front. A pterygo-sphenoid foramen was present on the right side. The muscular ridges were moderate. A third condyle was not present, and the right jugal process was tuberculated. The cubic capacity of the cranium was only 1252 c.c., therefore distinctly microcephalic.

TABLE II.

*Dravidian Tribes.*

|   | Nágesar.<br>Lukroo.                      | Bhuiyá. |        |        | Korwá.<br>Fukeera. | Tamil from<br>Madras. |       |
|---|--|---------|--------|--------|--------------------|-----------------------|-------|
|   | I.M.                                     | I.M.    | I.M.   | I.M.   | I.M.               | E.U.A.M.              |       |
| Collection number, . . .                        | 405                                      | 441     | 439    | 438    | 404                | ...                   | ...   |
| Age, . . . . .                                  | 30                                       | Adult.  | Adult. | Adult. | 28                 | Ad.                   | Ad.   |
| Sex, . . . . .                                  | M.                                       | M.      | M.     | F.     | M.                 | M.                    | M.    |
| Cubic capacity, . . . .                         | 1252                                     | 1438    | 1330   | 1255   | ...                | 1150                  | 1240  |
| Glabello-occipital length, .                    | 180                                      | 189     | 175    | 177    | 186                | 181                   | 181   |
| Basi-bregmatic height, . .                      | 132                                      | 136     | 142    | 131    | 137                | 131                   | 132   |
| <i>Vertical Index</i> , . . . .                 | 73.3                                     | 72.0    | 81.1   | 74.0   | 73.7               | 72.4                  | 72.9  |
| Minimum frontal diameter, .                     | 89                                       | 95      | 94     | 89     | 91                 | 90                    | 87    |
| Stephanic " " . . .                             | 108                                      | 116     | 112    | 110    | 105                | 99                    | 102   |
| Asterionic " " . . .                            | 102                                      | 106     | 109    | 96     | 107                | 101                   | 95    |
| Greatest parieto-squamous<br>breadth, . . . . . | 122s.                                    | 132s.   | 130s.  | 133p.  | 128p.              | 121s.                 | 130s. |
| <i>Cephalic Index</i> , . . . .                 | 67.8                                     | 69.8    | 74.3   | 75.1   | 68.8               | 66.9                  | 71.8  |
| Horizontal circumference, .                     | 495                                      | 520     | 492    | 490    | 511                | 490                   | 495   |
| Frontal longitudinal arc, .                     | 120                                      | 130     | 128    | 130    | 130                | 129                   | 123   |
| Occipital " " . . .                             | 243                                      | 253     | 234    | 125    | 138                | 125                   | 130   |
| Parietal " " . . .                              |  |         |        | 109    | 104                | 105                   | 108   |
| Total " " . . . .                               | 363                                      | 383     | 362    | 364    | 372                | 359                   | 361   |
| Vertical transverse arc, .                      | 288                                      | 302     | 313    | 305    | 300                | 273                   | 287   |
| Length of foramen magnum, .                     | 33                                       | 36      | 34     | 31     | 36                 | 34                    | 35    |
| Basi-nasal length, . . .                        | 98                                       | 105     | 103    | 95     | 105                | 104                   | 105   |
| Basi-alveolar length, . . .                     | 95                                       | 100     | 103    | ...    | 99                 | 95                    | 101   |
| <i>Gnathic Index</i> , . . . .                  | 96.9                                     | 95.2    | 100.   | ...    | 94.3               | 91.3                  | 96.2  |
| Interzygomatic breadth, .                       | 124                                      | 131     | 133    | 115    | 126                | 123                   | 123   |
| Intermalar " " . . .                            | 113                                      | 117     | 122    | 103    | 117                | 115                   | 114   |
| Nasio-mental length, . . .                      | 100                                      | ...     | ...    | ...    | 106                | 105                   | ...   |
| Nasio-alveolar " " . . .                        | 62                                       | 67      | 65     | ...    | 62                 | 59                    | 61    |
| <i>Complete facial Index</i> , . .              | 80.6                                     | ...     | ...    | ...    | 84.                | 85.3                  | ...   |
| Nasal height, . . . . .                         | 47                                       | 50      | 50     | ...    | 46                 | 47                    | 47    |
| Nasal width, . . . . .                          | 25                                       | 26      | 25     | ...    | 27                 | 27                    | 25    |
| <i>Nasal Index</i> , . . . . .                  | 53.2                                     | 52.     | 50.    | ...    | 58.7               | 57.4                  | 53.2  |
| Orbital width, . . . . .                        | 38                                       | 38      | 38     | 40     | 39                 | 39                    | 36    |
| Orbital height, . . . . .                       | 32                                       | 29      | 31     | 38     | 28                 | 29                    | 30    |
| <i>Orbital Index</i> , . . . . .                | 84.2                                     | 76.3    | 81.6   | 95.    | 71.8               | 74.4                  | 83.3  |
| Palato-maxillary length, . .                    | 54                                       | 56      | 54     | ...    | 54                 | 53                    | 53    |
| Palato-maxillary breadth, .                     | 60                                       | 65      | 66     | ...    | 65                 | 60                    | 62    |
| <i>Palato-maxillary Index</i> , . .             | 111.1                                    | 116.    | 122.2  | ...    | 120.               | 113.2                 | 116.  |
| Lower jaw.                                      | Symphysial height, . . .                 | 30      | ...    | ...    | 29                 | 28                    | ...   |
|   | Coronoid " " . . .                       | 60      | ...    | ...    | 57                 | 62                    | ...   |
|   | Condylod " " . . .                       | 59      | ...    | ...    | 54                 | 61                    | ...   |
|   | Gonio-symphysial length, .               | 80      | ...    | ...    | 90                 | 83                    | ...   |
|   | Inter-gonial width, outside,             | 93      | ...    | ...    | 96                 | 91                    | ...   |
|   | Breadth of ascending<br>ramus, . . . . . | 29      | ...    | ...    | 29                 | 34                    | ...   |



*Bhuiyá.* TABLE II.

In addition to the name Bhuiyá, these people are known by other appellations. Colonel DALTON uses as an alternative Bhúniyá, Mr BUCHANAN HAMILTON calls them Bhungiyá, Mr RISLEY adopts the form Bhuiyá, but gives a number of synonyms; Mr W. CROOKE also names them Bhuiyá. Mr RISLEY considers the name to mean "children of the soil," and that it is not employed as a definite tribal designation, but as implying a status or connection with the land. Bhuiyá is said to be a Sanskrit word, used over India from Assam to Rajputáná and from Madras to Behar, associated with some claim to land, a fact which Mr RISLEY regards as strongly supporting his contention. Mr O'DONNELL, in his Census Report, p. 42, states that Bhuiyá, from Bhui, land, is in Hindu terminology synonymous with autochthon. Colonel DALTON considers that in some parts of Chúta Nágpúr the name has a tribal significance, and he links them with the Dravidians. He says that the lowest type have swarthy, almost black skins, and coarse negro-like features. In the Keunjhar hills they are apparently the dominant aboriginal people, and are described by DALTON as having the skin varying from deep chocolate to tawny; very large mouths; thick, projecting lips; low, narrow foreheads; eyes dark, well-shaped; hair abundant on head but not on face; stature short, averaging 5 feet 2 inches. The higher types found in Gangpur and Bonai are dark brown in colour; hair black, straight, abundant on head, scanty on face; stature moderate; cheek and jaw bones projecting; face broad and square; nose rather retroussé, not very broad at the root; mouth and teeth well formed; eyes straight, not large or deeply set.

In the tributary States the girls seldom marry before puberty, but in other parts the marriage age is twelve, and in the land-holding class during infancy. In some places the unmarried men have a common domicile, and the girls also have a house set apart for them. Widows may marry again. The wealthier classes are properly clothed, but amongst the more primitive people the raiment is very scanty. The women are tattooed. The dead are cremated and the ashes are thrown into an adjoining stream. They eat pork and fowls, but not the flesh of the cow or buffalo. Many of the Bhuiyás are Hinduised, others worship their ancestors. Mr CROOKE states that the rules of succession do not differ from those of cognate Dravidian tribes.

The Indian Museum contains three adult crania marked Bhuiyá from Keunjhar in the Orissa Hills, presented by Dr W. D. STEWART in 1868. Two of these, Nos. 439, 441, were males; one, No. 438, was that of a woman.

When examined in the *norma verticalis* the general form was an elongated ovoid, but the greater projection of the parietal eminences in the woman's skull raised its breadth to 133 mm., which in relation to the length gave it a cephalic index 75·1. In the two male skulls the index was 69·8 and 74·3 respectively; both were dolichocephalic. In the woman's skull and in one of the men the vertex was comparatively flat; in the

other man it was more roof-shaped, and the antero-posterior curve was higher at the vertex. The backward slope to the occipital point was more prolonged in the other crania. In the men the basi-bregmatic height exceeded the greatest breadth. In the woman it was somewhat less, and the greater parietal projection gave a pentagonal outline to the cranium, in which the frontal longitudinal arc was the longest. In the two men, the large Wormian bones in the lambdoidal suture interfered with the measurements of the parietal and occipital longitudinal arcs. In two skulls a faint transverse depression behind the coronal suture indicated, that a band had been worn during infancy. The forehead in the woman and in one male was almost vertical, but receded somewhat in the other male. The skulls were cryptozygous or nearly so, and rested behind on the occiput. The glabella and supra-orbital ridges only slightly projected. The nasion was not much depressed; the nose had a definite bridge, concave forwards; the nasal spine of the superior maxillæ was moderate. The nasal index in the two men was mesorhine, 52 and 50 respectively; in the woman's skull the face was broken. In the men the orbital index was microseme, in the woman megaseme; the palato-maxillary index was brachyuranic; the gnathic index in one male was orthognathous, in the other mesognathous. The teeth were erupted, though in one male the wisdoms were not fully in place. The cranial sutures were unossified; epipteric bones were seen in two crania. In one male, stunted paramastoid processes were present. In the female skull each occipital condyle was almost equally divided by a constriction into an anterior and a posterior area. The cubic capacity of the female skull was 1255 c.c., and the mean of the two males was 1384 c.c.

### *Korwá.* TABLE II.

The Korwás are a Dravidian tribe living in Chúta Nágpúr, in the districts of Sargúja, Jashpúr, and Palámau, and claiming to be the aboriginal inhabitants. By some linguists the word Korwá is regarded as another form of Kol. They lead a nomadic life in the highlands, and armed with bows and arrows, are hunters and flesh eaters rather than agriculturists; though to some extent they are cultivators, and clear the ground by burning the jungle. DALTON states that they are the most savage looking of the Kolarian group of tribes. They are strongly built and active; the skin is dark brown, the face is broad, the forehead narrow, the hair is long and tangled, though in a figure of a man reproduced by Mr CROOKE, the head is shaven; they grow a beard and moustache. The more savage of the Korwás have black skins, flat faces, projecting chins, and tawny hair. In stature, the men of the Sargúja Korwás averaged 5 feet 3 inches, the women 4 feet 9 inches; but the men living on the Khúria plateau were somewhat taller; one measured 5 feet 8 inches. Both sexes are scantily clothed. They worship the tribal god Râja Chandol, and offer sacrifices to it, but the Sargúja tribe sacrifice to the spirits of their ancestors. They are totemistic, and apparently marriage is prohibited within the sept using the same totem. Mr CROOKE

says the marriage age for boys is twelve and ten for girls; widows may remarry. Some families cremate, others bury the dead. Mr O'DONNELL, in his Report on the Census of the Lower Provinces of Bengal, gives 79,954 persons as speaking the Korwá dialect of the Kolarian group of languages.

The Indian Museum contains a skull (No. 404) of a man of the Korwá tribe, 28 years old, named Fukeera, from Sargúja, Chúta Nágpúr. He died in prison, and the skull was presented by Lieut.-Colonel DÁLTON.

The cranium in the *norma verticqlis* was an elongated ovòid, very narrow, somewhat roof-like in the sagittal region, and with the sides of the skull almost vertical. The length-breadth index was only 68·8, and the skull was hyper-dolichocephalic. The parietal longitudinal arc was more than the frontal and much longer than the occipital. The basi-bregmatic height materially exceeded the greatest breadth, and the vertical index was 73·7. The parieto-occipital region sloped gently downwards, and the occipital squama was rounded and projected behind the inion. The glabella was moderate and the forehead was somewhat retreating. The nasion was shallow; the bridge of the nose was slightly projecting and vertically concave. The nasal spine of the superior maxillæ was distinct, and a sharp border separated the floor of the nose from the incisive region of the upper jaw. The nasal index was 58·7, distinctly platyrrhine; the gnathic index, 94·3, was that of an orthognathous jaw. The orbital index, 71·8, was mesoseme, and the palato-maxillary index, 120, was brachyuranic. The complete facial index, 84, placed it in the low-faced group, chamæprosopic. The teeth were fully erupted, but not much worn; the canine fossæ were depressed. Small Wormian bones were in the lambdoidal suture. The skull was phænozygous, and rested behind on the occipital bone.

#### *Múnda, Ho, or Larkha Kol.* TABLE III.

The Múndas are a large non-Aryan tribe, occupying the plateau in Chúta Nágpúr which attains an elevation of 3000 feet. On linguistic grounds they are classed as Kolarian. Mr RISLEY states that the name Múnda is of Sanskrit origin, and is applied to the headman of the tribe or village; it is also used generally as a tribal name. As regards their language, physical characteristics, and customs, the Múndas, Hos, Bhúmij, Korwá, Kharriás and Santals are closely allied, and from speaking the languages of the Kolarian group, they are frequently classed together as Kols or Coles. There is a difference of opinion as to the derivation and meaning of the term Kol. It has been regarded as signifying pig, and used by the Indo-Aryans as a term of contempt applied to the aborigines; but it is now, on the authority of DALTON, considered to be derived from the Mundári word Ho, or Horo, which means a man. According to tradition, the Kols were the earliest settlers in the valley of the Ganges.

DALTON in his account of the Múndas regards the Hos or Larkha (fighting) Kols as so closely allied to them, that they are often included together in the same descriptive sentence. He states that the Múndas are located in Singbhúm, Chúta Nágpúr, and in the

territory known as Kolhán. The Hos admit that they are of the same family as the Múndas, and that they came from Chúta Nágpúr. DALTON considers that, from their isolation and independence, they furnish the best illustration of the characteristics of the Mundáris. They are physically a much finer people than the Bhúmij, Santals, or Kharriás. The men are 5 feet 5 or 6 inches in height, the women 5 feet 2 inches; they have an erect carriage. The skin has a brownish coppery tint; the eyes are dark brown; the hair is black, straight or wavy. Many have high noses, oval faces, and young girls are sometimes seen with delicate features, finely chiselled straight noses, so that there may be an admixture of Aryan blood. DALTON has also met some with strongly marked Mongolian features and a dark skin like the Santals.

The clothing is reduced to a minimum, and often consists only of a loin-cloth brought between the thighs and fastened in front to a girdle. The women wear the hair collected into a knot touching the back of the right ear and decorated with flowers. Marriage is between adults and is exogamous, and widow marriage is permitted. The national emblem is a *godna* or arrow. The dead are cremated and the ashes are buried, the spot being marked by a large grave-stone, and often a megalithic monument is set up outside the village. They are active and courageous, truthful and sensitive to wrong. They cultivate the ground, but eat also fowls and the flesh of pigs. They worship the sun and several other deities. In the general Report on the Census of 1891, it is stated that the Múnda, Ho, Kol, Kur, and Korwá people number 1,109,157 by tribe, and that of these 840,282 speak the tribal language.

In the series of skulls lent to me by the Indian Museum, six specimens are marked Kol or Cole. One of these, No. 31, from Singbhúm, designated Larkha Kol, was presented by Colonel DALTON; another, No. 557, from the Kandhmals, marked Pan Cole, said to be 42 years old, height 5 feet 8 inches, and of dark complexion, was presented by Dr W. B. STEWART. Nos. 440, 442, and 444, also presented by Dr STEWART, were from Keunjhar, Orissa. No. 24, named Phugooa, given by Colonel DALTON, was from Moorgoo, Chúta Nágpúr; the age was said to be 65, the stature 5 feet 5 inches; hair of head straight, grey, that of face scanty; eyes regular; food rice, flesh, and vegetables.

In the same museum were nine skulls, marked Múnda from Chúta Nágpúr. Of these, No. 25 is said to have been in height 5 feet 4 inches; hair black, coarse, straight; eyes large, black, straight; food rice, flesh, vegetables; whilst No. 26 was 34 years old; height 5 feet 5 inches; hair black, coarse; eyes large, black, straight; food as above; they were presented by Colonel DALTON. The others were collected in or near Ranchi by Mr W. H. P. DRIVER. Dr HEDLEY WOOD has presented to me the skull of a woman aged 24, also obtained at Ranchi.

Sixteen crania marked Múnda or Kol have therefore come under observation; thirteen of which are apparently those of men and three those of women. They are all adults, with the exception of No. 25, said to be that of a youth of 18, in which, though the wisdom teeth were not erupted, the basi-cranial synchondrosis was ossified.

TABLE III.

*Munda, Kol.*

|  | Dholeja Munda.<br>Jurobaree. | Dhirhoo Munda.<br>Kakadeeh. | Hochar.<br>Lodha Village. | Biphaiya.<br>Madkom Village. | Mangra Munda.<br>Ranchi.<br>Old Town. | Debia Munda.<br>Lalpur Village. | Lallie Munda.<br>Konka Village. | Gonda Munda.<br>Lalpur Village. | Somari Munda.<br>Ranchi. | Kol.<br>Phugoo.<br>Moorgoo. | Larkha<br>Kol.<br>Singbhum.<br>Mora. | Kol.<br>Keunjhar. |       |       | Pan Cole. | Jattia Munda.<br>Bhowro Village. |
|--|------------------------------|-----------------------------|---------------------------|------------------------------|---------------------------------------|---------------------------------|---------------------------------|---------------------------------|--------------------------|-----------------------------|--------------------------------------|-------------------|-------|-------|-----------|----------------------------------|
|  | I.M.                         | I.M.                        | I.M.                      | I.M.                         | I.M.                                  | I.M.                            | I.M.                            | I.M.                            | Metopic.<br>E.U.A.M.     | I.M.                        | I.M.                                 | I.M.              | I.M.  | I.M.  | I.M.      | I.M.                             |
| Collection number, . . .                 | 25                           | 26                          | 603                       | 605                          | 606                                   | 612                             | 607                             | 611                             | ...                      | 24                          | 31                                   | 440               | 442   | 444   | 557       | 604                              |
| Age, . . . . .                           | 18                           | 32                          | 45                        | Ad.                          | Ad.                                   | Ad.                             | Ad.                             | Ad.                             | 24                       | Ad.                         | Ad.                                  | Ad.               | Ad.   | Ad.   | 42        | Ad.                              |
| Sex, . . . . .                           | M.                           | M.                          | M.                        | M.                           | M.                                    | M.                              | F.                              | F.                              | F.                       | M.                          | M.                                   | M.                | M.    | M.    | M.        | M.                               |
| Cubic capacity, . . .                    | 1248                         | 1210                        | 1375                      | 1430                         | 1315                                  | 1310                            | 1000                            | 1110                            | 1180                     | 1306                        | 1215                                 | 1470              | 1176  | 1220  | 1388      | 1200                             |
| Glabello-occipital length, .             | 176                          | 179                         | 180                       | 191                          | 183                                   | 180                             | 165                             | 168                             | 170                      | 182                         | 175                                  | 182               | 176   | 178   | 191       | 164                              |
| Basi-bregmatic height, .                 | 132                          | 128                         | 131                       | 141                          | 133                                   | 129                             | 130                             | 126                             | 128                      | 130                         | 130                                  | 138               | 130   | 130   | 126       | 132                              |
| Vertical Index, . . .                    | 75                           | 71.5                        | 72.8                      | 73.8                         | 72.7                                  | 71.7                            | 78.8                            | 75                              | 75.3                     | 71.4                        | 74.3                                 | 75.8              | 73.9  | 73    | 66        | 80.5                             |
| Minimum frontal diameter, . . .          | 89                           | 89                          | 96                        | 97                           | 89                                    | 90                              | 88                              | 92                              | 91                       | 94                          | 90                                   | 101               | 94    | 95    | 97        | 93                               |
| Stephanic, . . . . .                     | 102                          | 105                         | 102                       | 109                          | 99                                    | 100                             | 89                              | 97                              | 109                      | 111                         | 110                                  | 121               | 107   | 110   | 118       | 107                              |
| Asterionic, . . . . .                    | 105                          | 100                         | 104                       | 109                          | 99                                    | 105                             | 89                              | 93                              | 102                      | 104                         | 106                                  | 106               | 101   | 104   | 110       | 99                               |
| Greatest parieto-squamous breadth, . . . | 123s.                        | 127s.                       | 134s.                     | 130s.                        | 131p.                                 | 129p.                           | 112s.                           | 122s.                           | 125                      | 132s.                       | 132s.                                | 137s.             | 127s. | 127s. | 141s.     | 132s.                            |
| Cephalic Index, . . .                    | 69.9                         | 70.9                        | 74.4                      | 68.1                         | 71.3                                  | 71.7                            | 68                              | 72.6                            | 73.5                     | 72.5                        | 75.4                                 | 75.3              | 72.2  | 71.3  | 73.8      | 80.5                             |
| Horizontal circumference, .              | 488                          | 491                         | 493                       | 521                          | 498                                   | 491                             | 448                             | 460                             | 480                      | 506                         | 492                                  | 515               | 495   | 497   | 584       | 470                              |
| Frontal longitudinal arc, .              | 125                          | 112                         | 124                       | 135                          | 124                                   | 120                             | 112                             | 116                             | 120                      | 130                         | 122                                  | 130               | 122   | 124   | 130       | 118                              |
| Parietal " " " "                         | 131                          | 125                         | 124                       | 133                          | 136                                   | 120                             | 130                             | 130                             | 127                      | 129                         | 121                                  | 132               | 130   | 136   | 113       | 117                              |
| Occipital " " " "                        | 111                          | 118                         | 112                       | 130                          | 110                                   | 103                             | 99                              | 99                              | 101                      | 112                         | 116                                  | 120               | 108   | 104   | 128       | 108                              |
| Total " " " "                            | 367                          | 355                         | 360                       | 398                          | 381                                   | 366                             | 335                             | 345                             | 348                      | 371                         | 359                                  | 382               | 360   | 364   | 371       | 343                              |
| Vertical transverse arc, .               | 278                          | 285                         | 301                       | 312                          | 287                                   | 291                             | 277                             | 280                             | 237                      | 298                         | 290                                  | 312               | 287   | 295   | 298       | 300                              |
| Length of foramen magnum, . . .          | 35                           | 35                          | 33                        | 31                           | 36                                    | 32                              | 31                              | 32                              | 32                       | 35                          | 31                                   | 34                | 31    | 33    | 34        | 33                               |
| Basi-nasal length, . . .                 | 91                           | 101                         | 101                       | 102                          | 94                                    | 96                              | 98                              | 93                              | 95                       | 98                          | 95                                   | 101               | 101   | 101   | 101       | 97                               |
| Basi-alveolar length, . .                | 88                           | 95                          | 93                        | 102                          | 93                                    | 96                              | 95                              | 88                              | 94                       | 93                          | 86                                   | 100               | 99    | ...   | 99        | 95                               |
| Gnathic Index, . . . . .                 | 96.7                         | 94.1                        | 92.1                      | 100                          | 98.9                                  | 100                             | 96.9                            | 94.6                            | 98.9                     | 94.9                        | 90.5                                 | 99                | 98    | ...   | 98        | 97.9                             |
| Interzygomatic breadth, .                | 123                          | 122                         | 128                       | 130                          | 131                                   | 128                             | 115                             | 120                             | 125                      | 125                         | 131                                  | 133               | ...   | ...   | 133       | 126                              |
| Intermalar " " " "                       | 112                          | 109                         | 118                       | 122                          | 120                                   | 118                             | 109                             | 110                             | 114                      | 104                         | 119                                  | 120               | ...   | ...   | 120       | 115                              |
| Nasio-mental length, . .                 | 102                          | 107                         | 115                       | 117                          | 106                                   | 103                             | 98                              | ...                             | ...                      | ...                         | 107                                  | ...               | ...   | ...   | ...       | 100                              |
| Nasio-alveolar " " " "                   | 59                           | 62                          | 62                        | 70                           | 60                                    | ...                             | 54                              | 56                              | 64                       | 60                          | 63                                   | 68                | 63    | ...   | 63        | 58                               |
| Complete Facial Index, .                 | 82.9                         | 87.7                        | 89.8                      | 90                           | 80.9                                  | 80.4                            | 85.2                            | ...                             | ...                      | ...                         | 81.6                                 | ...               | ...   | ...   | ...       | ...                              |
| Nasal height, . . . . .                  | 45                           | 47                          | 47                        | 52                           | 48                                    | 45                              | 41                              | 42                              | 46                       | 46                          | 50                                   | 54                | 48    | ...   | 47        | 43                               |
| Nasal width, . . . . .                   | 28                           | 26                          | 28                        | 27                           | 25                                    | 25                              | 24                              | 22                              | 25                       | 23                          | 26                                   | 25                | 22    | ...   | 27        | 24                               |
| Nasal Index, . . . . .                   | 51.1                         | 55.3                        | 48.9                      | 51.9                         | 52.1                                  | 55.5                            | 58.5                            | 52.4                            | 53.9                     | 50                          | 52                                   | 46.3              | 45.8  | ...   | 57.4      | 55.8                             |
| Orbital width, . . . . .                 | 35                           | 39                          | 39                        | 40                           | 37                                    | 36                              | 37                              | 37                              | 36                       | 37                          | 40                                   | 40                | 39    | ...   | 40        | 38                               |
| Orbital height, . . . . .                | 34                           | 31                          | 30                        | 30                           | 29                                    | 31                              | 30                              | 34                              | 33                       | 32                          | 32                                   | 33                | 34    | ...   | 30        | 30                               |
| Orbital Index, . . . . .                 | 97.1                         | 79.5                        | 76.9                      | 75                           | 78.4                                  | 86.1                            | 81.1                            | 91.9                            | 91.7                     | 86.5                        | 80                                   | 82.5              | 87.2  | ...   | 75        | 73.9                             |
| Palato-maxillary length, .               | 49                           | 53                          | 49                        | 58                           | 56                                    | ...                             | 51                              | 45                              | 50                       | 54                          | 47                                   | 60                | 55    | ...   | 53        | 51                               |
| Palato-maxillary breadth, .              | 62                           | 66                          | 63                        | 68                           | 64                                    | ...                             | 62                              | ...                             | 60                       | 64                          | 66                                   | 69                | 65    | ...   | 63        | 59                               |
| Palato-maxillary Index, .                | 126                          | 124                         | 128.5                     | 117.2                        | 114.2                                 | ...                             | 121.5                           | ...                             | 120                      | 118                         | 140                                  | 115               | 118   | ...   | 118       | 115.6                            |
| Symphysial height, . . .                 | 30                           | 29                          | 31                        | 32                           | 31                                    | ...                             | 27                              | ...                             | ...                      | ...                         | 30                                   | ...               | ...   | ...   | ...       | 26                               |
| Coronoid " " " "                         | 60                           | 62                          | 65                        | 66                           | ...                                   | 63                              | 53                              | ...                             | ...                      | ...                         | 66                                   | ...               | ...   | ...   | ...       | 52                               |
| Condylod " " " "                         | 60                           | 60                          | 63                        | 64                           | ...                                   | 59                              | 54                              | ...                             | ...                      | ...                         | 61                                   | ...               | ...   | ...   | ...       | 58                               |
| Gonio-symphysial length, .               | 85                           | 86                          | 86                        | 91                           | 86                                    | 88                              | 80                              | ...                             | ...                      | ...                         | 85                                   | ...               | ...   | ...   | ...       | 80                               |
| Inter-gonial width outside, .            | 85                           | 91                          | 95                        | 99                           | 92                                    | 93                              | 93                              | ...                             | ...                      | ...                         | 91                                   | ...               | ...   | ...   | ...       | 86                               |
| Breadth of ascending ramus, .            | 30                           | 30                          | 37                        | 35                           | 35                                    | 31                              | 33                              | ...                             | ...                      | ...                         | 32                                   | ...               | ...   | ...   | ...       | 35                               |

\* With Skeletons.

Of the sixteen crania, No. 604, stated in the museum list to be Jattia Múnda, of Bhowro village, near Ranchi, differed so greatly in the form and proportions of the cranium from the others, that it will be described in a separate paragraph (p. 79). The following description applies therefore to fifteen skulls, and of these No. 444 consisted only of the calvaria. The lower jaw was absent in several specimens.

The crania presented in the *norma verticalis* an elongated ovoid form, with steep sides and moderate parietal eminences. The sagittal region showed no special ridge or flattening, nor was the slope outwards to the parietal eminence, though distinct, so marked as one sees in some aborigines. In the males, the glabello-occipital length ranged from 165 to 191 mm., and the greatest breadth from 123 to 141 mm. In three crania the cephalic index was below 70, hyper-dolichocephalic; in ten it ranged from 70 to 75, dolichocephalic; in two it was between 75 and 76, essentially dolichocephalic, though numerically in the mesaticephalic group. The mean cephalic index of the fifteen crania was 72. In these skulls the occipital was the smallest of the three longitudinal arcs, except in one specimen where it exceeded the frontal; usually the parietal had the longest arc, but in five specimens the frontal was the longer. In the males, the basi-bregmatic height ranged from 126 to 141 mm.; in the females from 126 to 130 mm. The mean vertical index in the fifteen crania was 73.4, i.e., metriocephalic. The basi-bregmatic height exceeded the greatest breadth in ten skulls; in four it was less, and in two the diameters were equal.

The forehead in the men did not much recede, and the skull sloped gently backwards in the parieto-occipital region; as a rule, the occipital squama was rounded, and projected behind the inion. The glabella and supra-orbital ridges were moderate; as a rule the nasion was not depressed. The nasal bones were not large, and the bridge was either feeble or only moderately projected. The nasal spine of the superior maxillæ was moderate. In some specimens a ridge demarcated the floor of the nose from the incisive region; but as a rule, they rounded off into each other. The mean nasal index in fourteen skulls was 52.1, high in the mesorhine series; but in the individual specimens, whilst five were markedly platyrrhine, seven were mesorhine, and two were leptorrhine; eight skulls were microseme, and the mean orbital index of the series was 83.5, i.e., microseme; but the range of variation was considerable, so that three were in the megaseme group and three were mesoseme. The mean gnathic index of the series was 96.6, i.e., orthognathous; no specimen was prognathous, and only six were mesognathous. In the male skulls the greatest interzygomatic breadth was 133 mm., but the mean of ten specimens was only 128.4, which is materially below the measurements of the face breadth given in Part I. of this memoir, in the Chinese, Burmese, Nágás, and Esquimaux. Owing to the lower jaw being absent in several specimens, the nasio-mental diameter could only be taken in eight skulls, all of which were chamæprosopic, and the mean of the series was 84.8. The mean palato-maxillary index was brachy-uranic, 121.7, and only one skull was below the lowest term of that group.

One skull, that of a woman, was metopic. The sutures were as a rule distinct,

though in some they were more or less obliterated. The skull marked Pan Cole had a transverse depression behind the coronal suture as if from wearing a band during infancy. Wormian bones were present in the lambdoidal suture in several specimens. Three crania had a single epipteric bone, and in No. 25 the squamous temporal articulated with the frontal; no skull had a third condyle, but in No. 557 each occipital condyle was divided into an anterior and a posterior facet. The jugal processes were sometimes tuberculated. The crania rested behind either on the mastoids or occipital region. Several specimens showed the infra-orbital suture, and in one of these the superior maxilla and sphenoid articulated at the anterior end of the sphenomaxillary fissure. The cranial capacity ranged in twelve men from 1176 to 1470 c.c.; the mean of the series was 1305 c.c., and seven specimens exceeded the mean. In the three women the range was from 1000 to 1180, and the mean was 1097 c.c.

No. 605, Biphaiya Munda from Madkom village, near Ranchi, was accompanied by a skeleton, the bones of which I have examined.

*Pelvis.*—The chief measurements of the pelvis are given below. The alæ were expanded and the iliac fossa were not translucent; the subpubic angle was relatively wide; the pectineal lines were not knife-like; there was a shallow præauricular sulcus. The breadth-height index of the entire pelvis was 81·2. The transverse diameter of the brim was much more than the conjugate, and the brim index was 86·7, *i.e.*, platypellic.\* The sacrum consisted of five vertebræ, and the sacral index was 110·5, *i.e.*, platyhieric.

#### *Measurements of Pelvis.*

| Collection, Indian Museum, . . . . .                   | No. 605 | No. 604 |  |  |  |  |
|--|---------|---------|--|--|--|--|
| Sex, . . . . .   | M.      | M.      |  |  |  |  |
| 1. Breadth of pelvis, . . . . .                        | 245mm   | 246mm   |  |  |  |  |
| 2. Height of pelvis, . . . . .                         | 199     | 178     |  |  |  |  |
| 3. <i>Breadth-height Index</i> , . . . . .             | 81·2    | 72·3    |  |  |  |  |
| 4. Between ant. sup. iliac spines, . . . . .           | 215     | 222     |  |  |  |  |
| 5. Between post. sup. iliac spines, . . . . .          | 82      | 73      |  |  |  |  |
| 6. Between ischial tubera, . . . . .                   | 136     | 116     |  |  |  |  |
| 7. Vertical diameter of obturator foramen, . . . . .   | 45      | 48      |  |  |  |  |
| 8. Transverse diameter of obturator foramen, . . . . . | 33      | 29      |  |  |  |  |
| 9. <i>Obturator Index</i> , . . . . .                  | 73·3    | 60·4    |  |  |  |  |
| 10. Subpubic angle, . . . . .                          | 83°     | 62°     |  |  |  |  |
| 11. Transverse diameter of brim, . . . . .             | 113     | 114     |  |  |  |  |
| 12. Conjugate diameter of brim, . . . . .              | 98      | 87      |  |  |  |  |
| 13. <i>Pelvic Index</i> , . . . . .                    | 86·7    | 76·2    |  |  |  |  |
| 14. Length of sacrum, . . . . .                        | 95      | 4 vert. |  |  |  |  |
| 15. Breadth of sacrum, . . . . .                       | 105     | 102     |  |  |  |  |
| 16. <i>Sacral Index</i> , . . . . .                    | 110·5   | ...     |  |  |  |  |

*True Vertebræ.*—The cervical vertebræ were normal. Of the twelve dorsal vertebræ 1st to 8th were normal. The 9th had a small costal articular facet at the upper border, but none at the lower border of the side of the body. The 10th, 11th, and 12th had

\* For the meaning of this and several other descriptive terms used to denote proportion between certain diameters of the skeleton, see my Report on Human Skeletons, in *Challenger Reports*, Part XLVII., 1886.

each a large single costal facet at the side of the body. The transverse process of the 10th dorsal had no costal facet, and those of the 11th and 12th had the usual three tubercles. The lumbar vertebræ were of the customary shape. The vertical diameter of their bodies in front and behind was as follows:—

|                       | A.V.D. | P.V.D.        | Indices.   |
|-----------------------|--------|---------------|------------|
| 1st lumbar, . . . . . | 24 mm. | 25 mm.        | 104        |
| • 2nd „ . . . . .     | 23 „   | 26 „          | 113        |
| 3rd „ . . . . .       | 23 „   | 26 „          | 113        |
| 4th „ . . . . .       | 20 „   | 22 „          | 110        |
| • 5th „ . . . . .     | 21 „   | 21 „          | 100        |
| Total 111 mm.         |        | Total 120 mm. | Mean 108·1 |

In this skeleton the upper four vertebræ had the posterior vertical diameter longer than the anterior. It is customary to find the antero-vertical diameter of the 5th vertebra longer than the postero-vertical, but in this specimen they were equal. The mean general index of the series of five vertebræ was as high as 108·1, which places the lumbar spine in the kailorachic group.

*Upper Limb.*—Clavicles slender, right 138 mm., left 136 mm. long; subclavian groove shallow. Scapulæ: right, 143 mm. long, 105 broad, index 73·4; left, 150 mm. long, 106 broad, index 70·6. Supra-scapular notch shallow and wide, but with a distinct border. Humerus with shallow musculo-spiral groove and moderate muscular impressions, no supra-condylar process or inter-condylar foramen. Bones of forearm not specially noticeable. Radio-humeral index, 83·3 or dolichokerkic.

|                                      | Right.  | Left.   |
|--------------------------------------|---------|---------|
| Humerus, head to trochlea, . . . . . | 307 mm. | 312 mm. |
| Radius to tip of styloid, . . . . .  | 256 „   | 255 „   |
| „ base „ . . . . .                   | 252 „   | 250 „   |
| Ulna to tip of styloid, . . . . .    | 281 „   | 281 „   |
| „ articular surface, . . . . .       | 276 „   | 278 „   |

*Lower Limb.*—Femur with lineæ aspera and external condylar ridge fairly well marked, also the trochanters and gluteal ridge; no platymery; articular area on internal condyle prolonged forwards and lying in the same transverse plane as the origin of the inner head of the gastrocnemius; popliteal surface plano-concave. Tibia with the head retroverted; condylar surfaces with shallow concavities; antero-posterior diameter of shaft of right tibia in plane of nutrient foramen, 36 mm.; transverse diameter in same plane 25 mm.; index of platyknesia 69·4; the corresponding diameters of the left bone were 37 and 24 mm. No articular facet on the front of lower end of left tibia continuous with the astragalar area was seen, but a slight indication of one was present in the right bone. The fibulæ had strong oblique ridges and a deep concavity for the origin of the tibialis posticus.

No. 604, referred to on p. 77, and marked Jattia Múnda from Bhowro village, is so different in configuration from the other Múnda crania that there can, I think, be little doubt that it has been erroneously named by the collector. The skull is brachycephalic, 80·5, in its proportions and form. It was rounded in outline when seen from the



norma verticalis, and comparatively flattened on the vertex. The frontal and parietal eminences were distinct, and the skull sloped steeply downwards in the parieto-occipital region, where it was unsymmetrical and flattened on the left side. The frontal longitudinal arc was the longest; the basi-bregmatic diameter was the same as the parieto-squamous. The upper jaw was orthognathous, the nasal index was platyrrhine, the orbital index was microseme, and the palato-maxillary index was barely brachy-uranic. Although I have given the measurements of the lower jaw sent with the skull, I doubt if it really belonged to it. The cranial capacity was 1200 c.c.

The skull was accompanied by other bones of the skeleton.

*Pelvis.*—The measurements of the pelvis are given on page 78. The iliac fossæ were translucent, and the alæ were expanded; the subpubic angle was acute; the obturator foramen had a long vertical diameter. The pelvis was broad in relation to the height, and the index was 72·3. The transverse diameter of the pelvic brim greatly exceeded the conjugate, and the brim index, 76·2, was platypellic. The pectineal lines were knife-like; the præauricular sulcus was faintly marked. Only four sacral vertebræ were present; the body of the 4th was oval like a normal 5th, and its laminæ formed two sacral cornua and did not meet behind in a spine. The base of the sacrum had on the right of its body an articular surface for the right transverse process of the 5th lumbar vertebra.

*True Vertebræ.*—The cervical vertebræ were normal. The dorsi-lumbar vertebræ were eighteen in number. The 10th had a single facet on the side of the body for a part of the head of the 10th rib; the 11th and 12th had single facets for their corresponding ribs, they had both rudimentary transverse processes, and the inferior articular processes of the 12th dorsal were convex, and looked forwards and outwards. There were six vertebræ between the 12th dorsal and 1st sacral. The first of these approximated in shape to the 12th dorsal; its transverse processes were rudimentary, and showed the superior, inferior and external tubercles. On the side of the pedicle, immediately in front of the external tubercle, was a smooth facet 2 mm. in diameter, apparently for the head of a rudimentary rib; its articular processes had the characters of a lumbar vertebra. The remaining five vertebræ had the customary lumbar characters, and the right transverse process of the lowest was divided by a deep furrow into a non-articular part, and an articular part which was jointed to the base of the sacrum. The vertical diameters of the bodies of these vertebræ, in front and behind, was as follows:—

|                     | Ant. V. Diam. | Post. V. Diam. | Index.     |
|---------------------|---------------|----------------|------------|
| Dorsi-lumbar, . . . | 23 mm.        | 26 mm.         | 113        |
| 1st lumbar, . . .   | 24 „          | 26 „           | 108·3      |
| 2nd „ . . .         | 24 „          | 25 „           | 104·1      |
| 3rd „ . . .         | 23 „          | 24 „           | 104·3      |
| 4th „ . . .         | 22 „          | 22 „           | 100·       |
| 5th „ . . .         | 24 „          | 21 „           | 87·5       |
| Total               | 117 mm.       | 118 mm.        | Mean 100·8 |

In this skeleton the 4th lumbar body showed an equality in the vertical diameters; in those higher up the posterior diameter exceeded the anterior, whilst in the lowest, the anterior was distinctly greater than the posterior diameter. The mean general index of the series of five vertebræ was 100·8, and the lumbar spine was in the orthorachic group.

*Upper Limb.*—The bones of the upper limb were slender, and the muscular markings were feeble. The Humerus had neither supra-condyloid process nor inter-condylar foramen; the musculo-spiral groove was shallow, and the shaft had only a slight twist. The right radio-humeral index was 75·3, mesatikerkic.

|  | Right.  | Left.   |
|--|---------|---------|
| Humerus, head to trochlea, . . . .         | 292 mm. | 288 mm. |
| Radius, head to tip of styloid, . . . .    | 220 "   | 222 "   |
| " " base " . . . .                         | 217 "   | 216 "   |
| Ulna, olecranon to tip of styloid, . . . . | 238 "   | 240 "   |
| " " lower articular surface, . . . .       | 234 "   | 236 "   |

The Clavicles were: right bone, 129 mm., left, 134 mm. long; their subclavian grooves were scarcely marked. The right Scapula was 129 mm. long and 91 broad, index 70·5; the left was 129 mm. and 94 broad, index 72·9; the supra-scapular notch was shallow and not differentiated from the superior border by a sharp margin.

*Lower Limb.*—The bones of the lower limb were also slender. In the Femur the trochanters and gluteal ridges were fairly marked, but there was no platymery. The linea aspera and external condylar ridge were distinct, the popliteal triangle was flattened or faintly concave; the inner condylar articular surface was prolonged backwards and in the same transverse plane as the place of origin of the inner head of the gastrocnemius. The head of the Tibia was slightly retroverted; the lower articular end was not prolonged on the front of the bone. The antero-posterior diameter of the shaft in the plane of the nutrient foramen was for the right bone, 28 mm.; for the left, 27 mm.; the transverse diameter was in each bone 21 mm.; the index of platyknesia was 75 in the right tibia.

In No. 605 the tibio-femoral index 86·4 was dolichoknemic; in No. 604 the index was 82·96, practically also dolichoknemic, i.e., with a relatively long tibia.

|  | No. 604. |         | No. 605. |         |
|--|----------|---------|----------|---------|
|  | Right.   | Left.   | Right.   | Left.   |
| Femur, maximum length, . . . .                       | 410 mm.  | 410 mm. | 445 mm.  | 445 mm. |
| " oblique length, . . . .                            | 405 "    | 408 "   | 441 "    | 441 "   |
| Tibia, condylar surface to tip of malleolus, . . . . | 343 "    | 336 "   | 395 "    | 393 "   |
| " " " astragular surface, . . . .                    | 336 "    | 332 "   | 381 "    | 381 "   |
| Fibula, maximum length, . . . .                      | 341 "    | 339 "   | 377 "    | 378 "   |

*Bhúmi*j. TABLE IV.

The *Bhúmi*j is a non-Aryan tribe living in the Manbhúm and Singbhúm districts of Chúta Nágpúr as well as in Western Bengal. They are regarded as the original inhabitants, and are located by DALTON in the country between the Kasai and Subarnarekhá rivers. They have been classed on linguistic grounds as Kolarian; most authorities regard them as closely allied to, and probably identical with, the Múndas, with whom they associate and intermarry. DALTON says that their appearance is inferior to that of the best of the Múndas and to the Hos of Singbhúm. They are short, but strongly built. The skin ranges in colour from a light brown to a dark chocolate. They build commodious houses and practise adult marriage. The divisions of the tribe are totemistic, and the marriage of adults is exogamous, as amongst the Múndas; widows may remarry. The dead are cremated, and the body is laid upon the pyre with the head to the south; the ashes are buried under gravestones, which are sometimes of large size. They are agriculturists, but they eat fowls and drink fermented liquors. They worship the sun as well as minor deities. Their numbers do not appear to have been separately recorded in the General Report on the Census of 1891, but in the special census of the lower provinces of Bengal and their Feudatories, Mr C. J. O'DONNELL gives a total of 306,473.

I have examined two skulls of the *Bhúmi*j tribe, both adult males, collected at Mánbhúm. One in the Indian Museum, No. 18, is named Aunundo Bhoomiz; in the list supplied to me he is said to have been 40 years of age, 5 feet 3 inches in height, hair and eyes black, whiskers small. The other, a male named Karnai, aged 30, was presented to me by Dr J. J. HEDLEY WOOD.

In both specimens the cranium was long, relatively narrow, and roof-shaped in the sagitto-parietal region. The parietal eminences were well in front of the occipital point which projected behind theinion; the side walls of the cranium were almost vertical. In one skull the length-breadth index was 72·7, in the other 70·9; both were dolichocephalic. In one the frontal and parietal longitudinal arcs were equal and in excess of the occipital; in the other the frontal arc was the longest. In one the basi-bregmatic diameter was less than the greatest breadth; in the other it was slightly longer. The glabella and supra-orbital ridges were moderately projecting; the forehead slightly receded; the antero-posterior curve of the vault rose gradually to the vertex, and then sloped gently downwards to the occipital squama. In neither skull was any sign of parieto-occipital flattening. The nasion was somewhat depressed; the nasal bones were short, concave forwards, and only feebly projecting. The nasal spine of the superior maxillæ was moderate, and the floor of the nose was separated by a slight ridge from the incisive surface of the jaw.

The nasal index in both specimens was in the higher mesorhine group; the gnathic index in both was orthognathous; one skull was mesoseme, the other megaseme; the

TABLE IV.

*Bhāmij and Turi Races.*

|   | Bhāmij. Mánbhúm.                         |             | Mánbhúm.<br>Race<br>unknown.<br>Scapho-<br>cephalic. |    | Turi.               |                      |  |  |  |
|---|--|-------------|--|----|---------------------|----------------------|--|--|--|
|   | Aunundo<br>Bhoomiz.                      | Karnai.     |  |    | Bitna.<br>Surangee. | Sookeam.<br>Teerrah. |  |  |  |
|   | I. M.                                    | E. U. A. M. | I. M.  |    | I. M.               | I. M.                |  |  |  |
| Collection number, . . .                        | 18                                       | ...         | 407  |    | 22                  | 23                   |  |  |  |
| Age, . . . . .                                  | 40                                       | 30          | Ad.  |    | 28                  | 35                   |  |  |  |
| Sex, . . . . .                                  | M.                                       | M.          | M.   |    | M.                  | M.                   |  |  |  |
| Cubic capacity, . . .                           | 1414                                     | 1235        | 1410   |    | 1280                | 1435                 |  |  |  |
| Glabello-occipital length, . .                  | 183                                      | 182         | 194  |    | 183                 | 188                  |  |  |  |
| Basi-bregmatic height, . .                      | 131                                      | 130         | 137  |    | 132                 | 132                  |  |  |  |
| Vertical Index, . . . .                         | 71·6                                     | 71·4        | 70·6   |    | 72·1                | 70·2                 |  |  |  |
| Minimum frontal diameter, . .                   | 94                                       | 89          | 93   |    | 93                  | 95                   |  |  |  |
| Stephanic, . . . . .                            | 115                                      | 113         | 107  |    | 110                 | 111                  |  |  |  |
| Asterionic, . . . . .                           | 105                                      | 100         | 114  |    | 99                  | 109                  |  |  |  |
| Greatest parieto-squamous<br>breadth, . . . . . | 133s.                                    | 129         | 125s.  |    | 133p.               | 135s.                |  |  |  |
| Cephalic Index, . . . .                         | 72·7                                     | 70·9        | 64·4   |    | 72·7                | 71·8                 |  |  |  |
| Horizontal circumference, . .                   | 517                                      | 502         | 520  |    | 514                 | 518                  |  |  |  |
| Frontal longitudinal arc, . .                   | 135                                      | 130         | 137  |    | 128                 | 127                  |  |  |  |
| Parietal " " . . . .                            | 135                                      | 125         | 143  |    | 131                 | 118                  |  |  |  |
| Occipital " " . . . .                           | 114                                      | 103         | 124  |    | 106                 | 129                  |  |  |  |
| Total " " . . . . .                             | 384                                      | 363         | 404  |    | 365                 | 374                  |  |  |  |
| Vertical transverse arc, . .                    | 302                                      | 233         | 298  |    | 308                 | 304                  |  |  |  |
| Length of foramen magnum, . .                   | 36                                       | 34          | 32   |    | ...                 | 38                   |  |  |  |
| Basi-nasal length, . . . .                      | 95                                       | 101         | 102  |    | 101                 | 99                   |  |  |  |
| Basi-alveolar length, . . . .                   | 92                                       | 93          | 94   |    | 102                 | 101                  |  |  |  |
| Gnathic Index, . . . . .                        | 96·8                                     | 92·1        | 92·2   |    | 101                 | 102                  |  |  |  |
| Interzygomatic breadth, . .                     | 129                                      | 126         | 125  |    | 124                 | 134                  |  |  |  |
| Intermalar " " . . . .                          | 110                                      | 119         | 117  |    | 115                 | 121                  |  |  |  |
| Nasio-mental length, . . . .                    | 120                                      | 113         | 109  |    | ...                 | 110                  |  |  |  |
| Nasio-alveolar " " . . . .                      | 66                                       | 64          | 65   |    | 61                  | 66                   |  |  |  |
| Complete Facial Index, . . .                    | 93                                       | 89·7        | ...  |    | ...                 | 82                   |  |  |  |
| Nasal height, . . . . .                         | 50                                       | 46          | 48   |    | 44                  | 46                   |  |  |  |
| Nasal width, . . . . .                          | 26                                       | 24          | 24   |    | 27                  | 24.                  |  |  |  |
| Nasal Index, . . . . .                          | 52                                       | 52·2        | 50   |    | 61·4                | 52·2                 |  |  |  |
| Orbital width, . . . . .                        | 38                                       | 35          | 37   |    | 41                  | 39                   |  |  |  |
| Orbital height, . . . . .                       | 33                                       | 32          | 29   |    | 31                  | 30                   |  |  |  |
| Orbital Index, . . . . .                        | 86·8                                     | 91·4        | 78·4   |    | 75·6                | 76·9                 |  |  |  |
| Palato-maxillary length, . .                    | 53                                       | 52          | 52   |    | 56                  | 58                   |  |  |  |
| Palato-maxillary breadth, . .                   | 61                                       | 69          | 61   |    | 65                  | 65                   |  |  |  |
| Palato-maxillary Index, . .                     | 115                                      | 132·7       | 117·3  |    | 116·                | 112·                 |  |  |  |
| Lower jaw.                                      | Symphysial height, . . . .               | 35          | 32   | 29 | ...                 | 32                   |  |  |  |
|   | Coronoid " " . . . . .                   | 65          | 55   | 64 | ...                 | 64                   |  |  |  |
|   | Condylod " " . . . . .                   | 58          | 59   | 65 | ...                 | 65                   |  |  |  |
|   | Gonio-symphysial length, . .             | 91          | 82   | 89 | ...                 | 96                   |  |  |  |
|   | Inter-gonial width outside, .            | 96          | 95   | 96 | ...                 | 98                   |  |  |  |
|   | Breadth of ascending<br>ramus, . . . . . | 30          | 33   | 37 | ...                 | 38                   |  |  |  |

palato-maxillary index in one was brachyuranic, in the other mesuranic. In one the complete facial index was chamæprosopic, in the other high-faced leptoprosopic. The teeth were somewhat worn from use; the canine and incisor fossæ were deep. The cranial sutures were distinct. In one there were no irregular ossifications; in the other the right pterion had a large epipterice bone. The muscular ridges and processes were well marked. In one the cubic capacity, 1414, was mesocephalic; in the other, 1235 c.c., microcephalic. The lower jaw was well proportioned and possessed a square chin.

Another skull from Manbhūm, an adult male, No. 407 in the Indian Museum, is marked "race unknown." It is a characteristic specimen of a scaphocephalic cranium. Although not known to be a Bhūmij, yet as it came from Manbhūm, it is convenient to describe its characters here. The skull was greatly elongated and narrow, strongly keeled in the sagittal region, and with the suture obliterated; the lambdoidal suture was almost completely obliterated, but the coronal and the lateral longitudinal sutures were to all appearance unossified. The glabella and supra-orbital ridges were prominent, and the nasion was depressed. The nasal bones were short and prominent. The canine and incisive fossæ were deep. The nasal spine of the superior maxillæ was moderate. The dimensions of the skull are given in Table IV. The modifications in shape produced by the premature closure of the sagittal and lambdoidal sutures have, however, deprived this skull of any ethnic significance. It will be seen from the Table that owing to the elongation of the cranium and the diminished parieto-squamous breadth, the length-breadth index is only 64.4. The cubic capacity, 1410 c.c., is apparently not affected by the cranial deformity.

#### *Turi.* TABLE IV.

The Turis are a non-Aryan tribe or caste, living in Chūta Nágpur. In his account of these people Mr RISLEY states that they are without doubt a Hinduised offshoot of the Múndas. He adduces in support of this opinion the following:—They use amongst themselves a dialect of Mundari; their totems correspond closely with those in force amongst the Múndas; their original religion is closely akin to the form of animism current among the Múndas.

The Turis are cultivators and makers of baskets. They are, like the Múndas and Oráons, lax in articles of food. Each sub-caste is strictly endogamous. Girls usually marry as adults and widows can marry again. The caste is small, and in 1881 numbered apparently about 30,000 persons.

Two crania, marked Turi, are in the Indian Museum. No. 22 is that of Bitna, from Surungee. He was 28 years old; 5 feet 4 inches high; hair black, straight; eyes black, small; no beard or whiskers. No. 23, Sookeam, was from Teerrah. He was 35 years old; 5 feet 3 inches high; hair black, straight; eyes black; no beard or whiskers. Both men had been hanged in Ranchi jail as murderers.

The skulls resembled each other in the *norma verticalis*; they were elongated ovoids, with distinct parietal eminences, and with a moderate slope outwards from the sagittal suture. They were both dolichocephalic, the mean length-breadth index being 72·2; in Bitna the parietal arc was a little longer than the frontal, but in Sookeam the occipital arc had the unusual diameter, 129 mm., and was longer than either the frontal or parietal. In each skull the basi-bregmatic height was slightly less than the breadth. The forehead was moderately receding, and the glabella and supra-orbital ridges were not prominent; the crania sloped gently backwards and downwards from the obelion; the occipital squama was rounded and prominent. The upper jaw slightly projected, and the gnathic index, mesognathous, was 101 and 102. The nasion was shallow; the bridge of the nose was concave vertically; the nasal spine of the superior maxillæ was moderate, and the anterior nares were rounded at the junction of the side-wall and floor. The nasal index in Bitna was markedly platyrrhine; in Sookeam it was mesorrhine, and in his skull the face was chamæprosopic. In both skulls the orbital index was microseme; in one the palato-maxillary index was mesuranic, in the other in the lower term of the brachuranic group. In No. 22 the arch of the palate was much deeper than in No. 23. Both crania were barely cryptozygous, and they rested behind on the cerebellar part of the occiput. In Bitna the wisdoms were erupted, in the other skull in process of eruption; the incisor fossæ were deeper than the canine. The frontal suture was closed, but the other sutures were not ossified. In No. 23, small Wormian bones were in the lambdoidal suture, but there were no other special abnormalities. The muscular ridges were fairly developed. In Bitna the cranial capacity was only 1280 c.c., *i.e.*, microcephalic, whilst in Sookeam the capacity, 1435 c.c., placed it high in the mesocephalic group.

*Juang.* TABLE V.

The Juangs are a non-Aryan tribe living in the hill districts of Dhekanál and Keunjhar, two of the tributary states of Orissa. DALTON groups them with the Kolarians on account of some affinities of language, but he also says that, whilst they have adopted many Uriyá words, they employ vocables which cannot be connected with any Aryan, Kolarian, or Dravidian language. They are a primitive people, and claim to be the autochthones in Keunjhar. They are remarkably shy and timid. The stature of the men is somewhat less than 5 feet, that of the women about 4 feet 8 inches; the forehead is upright, but narrow and low; nasal bones depressed, alæ of nose spreading; mouth large, lips thick, upper jaw rarely prognathous, chin receding; hair coarse and frizzly; prevailing colour of skin a reddish brown; the jaw is flat, and the cheek bones are strongly projecting. The women tattoo the forehead and temples. Those seen by DALTON were not clothed, but wore a girdle composed of several strings of beads from which depended scanty curtains of leaves. The men wear a small cotton loin cloth. They had no knowledge of metals or pottery. They cremate the dead, and place the body on the bier with the head to the south; the ashes are thrown into a running

stream. Their huts are low, and measure about 6 feet by 8; but the boys of the village occupy a common dormitory. Marriage takes place between adults, and widows may remarry. They are exogamous. They are semi-nomadic in their habits, cultivate the ground sparingly, and eat all kinds of flesh. Little is known of their religious creed, and they make sacrifices to the sun and earth. 11,171 persons were said in 1891 to speak the tribal language.

The Indian Museum contains two skulls from Keunjhar in the Orissa hills, stated in the MS. Catalogue to be those of Juangs. They were presented by Dr STEWART in 1868. The larger skull, No. 445, is that of a man. The smaller, No. 446, is that of a woman. The male skull in the *norma verticalis* was an elongated ovoid, sloping steeply from the sagittal suture to the parietal eminences, below which the side walls of the skull were almost vertical. The cephalic index was 73·2, and the skull was dolichocephalic in form and proportions. In both, the parietal longitudinal arc exceeded the frontal. The height in the male was greater than the breadth, and the vertical index was 79·3. The glabella and supra-orbital ridges were moderate, the forehead was not specially receding, the slope from the obelion was not precipitous, and the occipital squama above the inion was not prominent, but there was no evidence of parieto-occipital flattening. The fronto-nasal suture was shallow; the nasal bones were short, narrow, concave forwards, and only slightly projecting. The canine and incisor fossæ were not specially marked; the skull was barely cryptozygous, it rested behind on the mastoids. The occipital bone sloped steeply upwards from the foramen magnum to the inion. The muscular ridges and processes were moderate; the sutures were simple and often with two small Wormian bones in the lambdoidal suture. The parieto-sphenoid articulations were broad. The sockets of the teeth were broken, and there were no marked osseous irregularities.

The female skull was much smaller; it was more flattened on the vertex than the male. Proportionally it was not so elongated, and its cephalic index was 77·4. The height was a little less than the breadth, and the vertical index was 76·2. The forehead was more vertical, and the glabella and supra-orbital ridges were feeble; the occipital squama above the inion was more projecting, and below the inion it was not so steep as in the male skull. There was no evidence of parieto-occipital flattening. The nasal bones were larger than in the man, but the bridge of the nose had a similar curvature. The canine fossæ were more hollowed out, and the teeth were much worn down. The cranial sutures were in process of obliteration; small Wormian bones were present in the lambdoidal suture; the parieto-sphenoid articulation was moderately broad. The mastoids were very feeble. The skull was cryptozygous, and rested behind on the occipital condyles.

Both crania were orthognathous and platyrrhine. The proportions of the orbit in the woman were microseme, and in the man megaseme. The cranial capacity of the woman was very low, 1030 c.c.; but in the man it reached 1420 c.c.

TABLE V.

*Juangs, and various Tribes or Castes.*

|  | Juang. |       | Koydwar.<br>Nagooloo. | Bunjana. | Rhima. |       | Ahir-<br>Goálá.<br>Teetoo.<br>Puttea. | Teli. |             | Kámár.<br>Bhudny.<br>Hazári-<br>bágh. | Lohár.<br>Ranchi. |
|--|--------|-------|-----------------------|----------|--------|-------|---------------------------------------|-------|-------------|---------------------------------------|-------------------|
|  | I.M.   | I.M.  | I.M.                  | I.M.     | I.M.   | I.M.  | I.M.                                  | I.M.  | E. U. A. M. | E. U. A. M.                           | I.M.              |
| Collection number, . . .                           | 443    | 445   | 284                   | 285      | 602    | 599   | 27                                    | 598   | ...         | ...                                   | 600               |
| Age, . . . . .                                     | Ad.    | Ad.   | 50                    | 40       | Ad.    | Ad.   | 25                                    | Ad.   | 23          | Ad.                                   | Ad.               |
| Sex, . . . . .                                     | M.     | F.    | M.                    | M.       | M.     | F.    | M.                                    | M.    | F.          | F.                                    | F.                |
| Cubic capacity, . . . .                            | 1420   | 1030  | 1267                  | 1292     | 1270   | 1170  | 1328.                                 | 1370  | 1005        | 1230                                  | 1240              |
| Glabello-occipital length, .                       | 179    | 164   | 181                   | 166      | 180    | 178   | 183                                   | 184   | 168         | 173                                   | 170               |
| Basi-bregmatic height, . .                         | 142    | 125   | 126                   | 131      | 132    | 125   | 135                                   | 138   | 110         | 128                                   | 131               |
| Vertical Index, . . . . .                          | 79.3   | 76.2  | 69.6                  | 78.9     | 73.3   | 70.2  | 73.8                                  | 75.   | 65.8        | 74.                                   | 77.1              |
| Minimum frontal diameter, .                        | 95     | 87    | 87                    | 93       | 89     | 92    | 89                                    | 95    | 89          | 90                                    | 90                |
| Stephanic, . . . . .                               | 109    | 110   | 112                   | 112      | 102    | 103   | 102                                   | 109   | 104         | 102                                   | 107               |
| Asterionic, . . . . .                              | 103    | 94    | 104                   | 106      | 100    | 98    | 100                                   | 108   | 94          | 100                                   | 103               |
| Greatest parieto - squamous<br>breadth, . . . . .  | 131p.  | 127s. | 129s.                 | 142s.    | 130s.  | 123p. | 125p.                                 | 134s. | 121         | 128                                   | 130s.             |
| Cephalic Index, . . . . .                          | 73.2   | 77.4  | 71.3                  | 85.5     | 72.2   | 69.1  | 68.3                                  | 72.8  | 72.         | 74.                                   | 76.5              |
| Horizontal circumference, .                        | 500    | 465   | 498                   | 495      | 494    | 491   | 502                                   | 508   | 474         | 481                                   | 473               |
| Frontal longitudinal arc, . .                      | 120    | 120   | 128                   | 121      | 122    | 130   | 126                                   | 125   | 114         | 125                                   | 126               |
| Parietal " " . . . . .                             | 135    | 125   | 120                   | 120      | 126    | 130   | 137                                   | 253   | 120         | 118                                   | 120               |
| Occipital " " . . . . .                            | 115    | 96    | 110                   | 103      | 113    | 96    | 107                                   | ...   | 105         | 105                                   | 106               |
| Total " " . . . . .                                | 370    | 341   | 358                   | 344      | 361    | 356   | 370                                   | 378   | 339         | 348                                   | 352               |
| Vertical transverse arc, . .                       | 310    | 283   | 290                   | 305      | 296    | 285   | 292                                   | 292   | 269         | 281                                   | 288               |
| Length of foramen magnum, .                        | 33     | 30    | 35                    | 37       | 35     | 36    | 41                                    | 36    | 27          | 34                                    | 34                |
| Basi-nasal length, . . . .                         | 106    | 93    | 100                   | 98       | 102    | 91    | 96                                    | 102   | 91          | 100                                   | 96                |
| Basi-alveolar length, . . .                        | 103?   | 86    | 96                    | 93       | 99     | 90    | 87                                    | 97    | 95          | 95                                    | 89                |
| Gnathic Index, . . . . .                           | 97.2   | 92.5  | 96.                   | 94.9     | 97.1   | 98.9  | 90.6                                  | 95.1  | 104.4       | 95.                                   | 92.7              |
| Interzygomatic breadth, . .                        | 126    | 121   | 119                   | 131      | 131    | 122   | 124                                   | 134   | 119         | 123                                   | 123               |
| Intermalar, . . . . .                              | 116    | 107   | 109                   | 120      | 118    | 112   | 111                                   | 120   | 114         | 112                                   | 112               |
| Nasio-mental length, . . .                         | ...    | ...   | 100                   | 105      | 104    | ...   | 106                                   | ...   | ...         | ...                                   | 106               |
| Nasio - mental complete facial<br>Index, . . . . . | ...    | ...   | 84.                   | 80.      | ...    | ...   | ...                                   | ...   | ...         | ...                                   | 60                |
| Nasio-alveolar length, . . .                       | ...    | 60    | 60                    | 63       | 64     | 65    | 63                                    | 67    | 58          | 59                                    | ...               |
| Maxillary upper facial Index, .                    | ...    | ...   | 50.4                  | 48.      | 79.4   | ...   | 85.                                   | ...   | ...         | ...                                   | 86.1              |
| Nasal height, . . . . .                            | 47     | 44    | 48                    | 49       | 50     | 46    | 47                                    | 47    | 42          | 45                                    | 46                |
| Nasal width, . . . . .                             | 25     | 24    | 27                    | 26       | 21     | 23    | 25                                    | 25    | 24          | 24                                    | 22                |
| Nasal Index, . . . . .                             | 53.2   | 54.5  | 56.3                  | 53.1     | 42.    | 50.   | 53.2                                  | 53.2  | 57.1        | 53.3                                  | 47.8              |
| Orbital width, . . . . .                           | 39     | 38    | 38                    | 38       | 36     | 39    | 39                                    | 39    | 36          | 36                                    | 37                |
| Orbital height, . . . . .                          | 35     | 31    | 29                    | 35       | 32     | 36    | 34                                    | 31    | 31          | 30                                    | 32                |
| Orbital Index, . . . . .                           | 89.7   | 81.6  | 76.3                  | 92.1     | 88.9   | 92.3  | 87.2                                  | 79.5  | 86.1        | 83.3                                  | 86.5              |
| Palato-maxillary length, . .                       | ...    | 47    | 52                    | 50       | 53     | 54    | 52                                    | 53    | 54          | 52                                    | 49                |
| Palato-maxillary breadth, . .                      | ...    | 55    | 59                    | 61       | 60     | 61    | 63                                    | 65    | 65          | 64                                    | 58                |
| Palato-maxillary Index, . . .                      | ...    | 117.  | 113.4                 | 122.     | 113.2  | 112.9 | 121.1                                 | 122.6 | 120.        | 123.                                  | 118.3             |
| Lower jaw. { Symphysial height, . . .              | ...    | ...   | 28                    | 27       | 22     | ...   | 30                                    | ...   | ...         | ...                                   | 28                |
| Coronoid " " . . . . .                             | ...    | ...   | 57                    | 60       | 65     | ...   | 61                                    | ...   | ...         | ...                                   | 51                |
| Condylod " " . . . . .                             | ...    | ...   | 58                    | 63       | 60     | ...   | 56                                    | ...   | ...         | ...                                   | 48                |
| Gonio-symphysial length, . .                       | ...    | ...   | 83                    | 82       | 80     | ...   | 89                                    | ...   | ...         | ...                                   | 81                |
| Inter-gonial width, . . . .                        | ...    | ...   | 95                    | 88       | 94     | ...   | 101                                   | ...   | ...         | ...                                   | 92                |
| Breadth of ascending ramus, .                      | ...    | ...   | 27                    | 28       | 33     | ...   | 30                                    | ...   | ...         | ...                                   | 34                |



• *Bhima.* TABLE V.

Two skulls, Nos. 599, 602, presented to the Indian Museum by Mr W. H. P. DRIVER, are marked Bhima race. The former is apparently that of a woman, and the latter that of a man who died in Ranchi. I have had a difficulty in determining the tribe, caste, or race known as Bhima. I find, however, that Mr ROBERTSON, in his *Report*, p. 183, speaks of Bhimas as vagrants who form a small sub-division of the Gonds; but it is possible that it may be a mis-spelling of Bhaina, a tribe living along the southern border of Chútá Nágpúr.

The general form of the skulls in the *norma verticalis* was an elongated oval with the sides of the cranium steep, the parietal eminences not very bulging. The sagittal region was not ridged, and the slope downwards to the parietal eminences was not very steep. The slope from the obelion to the occipital point was gradual; the occipital squama moderately projected. In both, the length-breadth index was dolichocephalic; in the male the parietal longitudinal arc exceeded the frontal; in the female they were equal. In each skull the basi-bregmatic diameter was greater than the parieto-squamous, and the vertical index was higher than the cephalic. The forehead did not much recede, and the glabella and supra-orbital ridges showed no special projection. The nasal bones had not much prominence, and the bridge was concave in the vertical direction; the nasal spine of the superior maxillæ was relatively small. In the male the anterior nares were narrow, and the index was leptorhine; in the woman it was mesorhine. In the man the upper jaw was orthognathous, in the woman mesognathous. In the man the orbital index was mesoseme, in the woman megaseme. In both the palato-maxillary index was mesuranic. The cubic capacity was microcephalic, 1270 and 1170 c.c. respectively.

• *Koydwar.* TABLE V.

The Indian Museum contains the skull, No. 284, of a man named Nagooloo, 50 years old, from Bijji, Bastar State, Central Provinces. He is said to have been of short stature; skin black; hair black and soft; eyes dirty brown; a moustache; food rice, flesh, fish, vegetables. He is stated in the list sent to me to be of the Koydwar race. It is possible that this term may be a mis-spelling for Kotwári, a term applied to the caste which performs the service of village watchman.

The skull was elongated and ovoid in the *norma verticalis*; the sides were moderately steep, the sagittal region was not ridged, the parietal eminences were much in advance of the occipital point, and the occipital squama was rounded and prominent. The length-breadth index was 71·3, and the skull was dolichocephalic. The frontal longitudinal arc was the longest. The basi-bregmatic height was a little below the greatest breadth, and the vertical index, 69·6, was tapeinocephalic. The anterior nares were wide, and the nasal index, 56·3, was distinctly platyrrhine. The upper jaw was

orthognathic, the gnathic index being only 96. The orbits were low, and the index was 76·3. The palato-alveolar arch was mesuranic. The complete facial index, 84, was chamæprosopic. The teeth were much worn. The sutures of the cranial vault were nearly obliterated. The skull was cryptozygous. The cranial capacity was 1267 c.c.

*Bunjana.* TABLE V.

A skull in the Indian Museum, No. 285, from the Central Provinces from Koromankiai near Bastar, marked Bunjana, is probably that of a Banjára or Bunjára. It is that of a man æt. 40, 5 feet 3 inches high; he had skin dark brown; hair grey; eyes dirty brown; a moustache; food, rice, mutton, vegetables. The Bunjaras are a nomadic class, engaged in the occupation of carrying goods by pack-bullocks.

This skull did not possess an elongated oval form. When seen from the *norma verticalis* it was more rounded, and its greatest length was only 166 mm. The parieto-occipital region was flattened, and as it was not symmetrical, it is probable that artificial pressure had been applied during infancy. The length-breadth index was 85·5 and the skull was hyper-brachycephalic. The frontal longitudinal arc was 1 mm. longer than the parietal. The basi-bregmatic height was much less than the greatest breadth, and the vertical index was 78·9. The anterior nares were wide, and the index was platyrrhine. The upper jaw was orthognathous. The height and width of the orbits were almost equal, and the index was megaseme. The palato-maxillary index was brachyuranic, and the palate had a wide horse-shoe shape. The face was chamæprosopic, and the complete facial index was only 80. The teeth were much worn and stained with betel. The cranial sutures were distinct; small Wormian bones were present in the lambdoidal suture; the pterion was normal. The skull was cryptozygous. The cranial capacity was 1292 c.c.

*Kámár and Lohár.* TABLE V.

These names are applied to castes who manufacture articles in metal. The Kámárs work in metals generally; the Lohárs are the blacksmiths or workers in iron. The Kámárs are found in Bengal and Behar;\* the Lohárs in Western Bengal, Behar, and Chúta Nágpúr. Mr RISLEY considers that these caste names express only a similarity in occupations, and do not indicate uniformity in race. He also states that the lohár or blacksmith is a recognised official in a Kol village community. Each caste is probably composed of persons belonging to different tribes, some of which are probably indigenous to the locality, whilst others have migrated into the district in which they live, so that they may include Aryans, Aborigines, and crosses between Aryan and non-

\* Mr ROBERTSON, in his *Report on the Census in the Central Provinces*, p. 190, states that in Raipur a tribe of people named Kámár live in remote jungles on fruits and small game, and although in some provinces, as Bengal, the term is an occupational one, it includes both aborigines and non-aboriginal people.

Aryan people. He supports this view by citing the prevalence of different social customs as well as religious differences. Some are orthodox Hindus, others worship gods not included in the Hindu mythology. As regards marriage, both infant and adult marriage prevail; widow marriage is allowed by some, but forbidden by others. Some groups permit marriage within the group, whilst others are exogamous. Cremation is practised by the Kámárs.

I have examined the skull of a Kámár named Bhudny, from Hazáribágh, said to be a woman, presented to me by Dr. J. J. HEDLEY WOOD; also that of a Lohár, who died at Ranchi, No. 600 in the India Museum.

The Kámár skull, ovoid in its general form, was long in relation to the breadth; its sides were vertical, but it was not so roof-shaped as in some of the dolichocephali; the length-breadth index was 74, and the frontal longitudinal arc was the longest. The basi-bregmatic corresponded with the greatest parieto-squamous diameter. The projection of the glabella and supra-orbital ridges gave one the impression of a male rather than a female cranium, but the forehead receded very slightly, and the vertex was inclined to be flattened; the parieto-occipital region sloped gently into a rounded occipital squama. The nasion was a little depressed; the bridge of the nose was concave, but projected at the tip; the nasal spine of the superior maxillæ was moderate, and a low ridge separated the floor of the nose from the incisive region. The anterior nares were large and platyrrhine, the upper jaw was orthognathous; the orbits were mesoseme, and the palate was brachyuranic. There was no lower jaw. The teeth were only slightly worn, though some were carious; the canine and incisive fossæ were deep. The sutures were unossified; from their condition and that of the teeth the age was probably about 30. There were no Wormian bones, but a large epipterion was in each pterion; with this exception no osseous irregularities were observed. The cranial capacity was 1230 c.c.

The Lohár skull was probably that of a female. Its breadth bore to the length a proportion which placed the cranium in the lower term, 76·5, of the mesaticephalic group, and the greatest breadth was about the squamous suture; the frontal longitudinal arc was the longest. The height was somewhat greater than the breadth, and the vertical index was 77·1. The left parieto-occipital region was a little flattened. The nasal bones had but little projection, and the bridge was concave vertically; the nasal spine of the superior maxillæ was small. The nose was relatively narrow and with a leptorrhine index; the upper jaw was orthognathous, the orbit was mesoseme, and the palate was brachyuranic. The face was chamæprosopic. The cranial capacity, 1240 c.c., was microcephalic.

#### *Ahír-Goálá.* TABLE V.

The Goálás or Gopas are the pastoral caste of India, extensively diffused in the North-West Provinces, the valley of the Ganges, Behar, Orissa, and Chúta Nágpúr. The name Ahír is applied to the whole caste in North-Western India; but in the south

and east it is apparently restricted to one of its divisions, the entire caste being named Goálá. The Ahír or Goálá, whose duty it is to look after the cattle, is, according to Mr RISLEY, one of the recognised officials of a Kol village community. Colonel DALTON groups the Ahírs as Aryans, but in the mountainous districts of Orissa and Chúta Nágpúr, they seem to have had incorporated with them a proportion of the aboriginal inhabitants, who have become Hinduised. In consequence of this intermixture, the physical characters of the caste vary in different localities. DALTON states that the Mathuráhasis have high, sharp and delicate features, and light brown skins quite of the Aryan type; whilst the Maḡadhas have coarse features, the skin is dark in colour, the hands and feet are large, and the difference between them and the Kol-speaking people of Singbhúm is not distinguishable. The intermixture also affects the customs of the caste. Marriage usually takes place in infancy, though in Chúta Nágpúr adult marriage is permitted, and in the hill districts the marriage of widows is sanctioned. RISLEY states that in Chúta Nágpúr a man may not marry a woman of his own totem. Cremation is practised on the dead bodies of married persons, but not on those of children. In religion they are Hindus, and observe the usual festivals. The Ahírs and Goálás together numbered, in 1891, about eleven and a half millions of people.

In the Indian Museum is a skull, No. 27, marked Ahír, Goálá caste, which was presented in 1863 by Lieut.-Col. DALTON; the man, Teetoo, from Puttea, was hanged in Ranchi jail. He is said to have been 25 years old, 5 feet 2 inches high; hair black, long, coarse; eyes black, set straight in the face; food, rice, vegetables, and flesh.

The cranium, seen in the *norma verticalis*, was a very elongated ovoid, the sides vertical, with a slight sagittal ridge, and a slope outwards to the parietal eminences. The length-breadth index was 68·3, and the skull was hyper-dolichocephalic; the parietal longitudinal arc was much longer than either the frontal or occipital; the basi-bregmatic height exceeded considerably the breadth, and the vertical index was 73·8. The glabella and supra-orbital ridges were moderate; the forehead was somewhat retreating; the parieto-occipital region sloped gently backwards, and was flattened from side to side; the occipital squama was not prominent, and projected very little behind the inion. The nasion was slightly depressed; the bridge of the nose was not prominent, and was concave from above downwards. The nasal spine of the superior maxillæ was distinct, and a sharp ridge separated the floor of the nose from the incisive region. The nasal index was 53·2, i.e., platyrrhine; the gnathic index, 90·6, markedly orthognathous; the orbital index, 87·2, was mesoseme; the palato-maxillary index, 121·1, was brachyuranic; the complete facial index was 85, so that the face was chamæprosopic. The teeth were all erupted and a little worn; the incisive fossæ in the upper jaw were deep, and the canine fossæ were well marked. The cranial sutures were simple, and showed signs of commencing ossification. No Wormian bones were present, but a large epipteris bone was seen in each pterion. The jugal processes were tuberculated. The lower jaw was well developed. The skull was phænozygous and rested behind on the mastoid-temporals. The cubic capacity of the cranium, 1328 c.c., placed it in the microcephalic group.

*Teli.* TABLE V.

The Teli or Tili is a banking, trading, and oil-pressing caste in Bengal, Behar, and Orissa. Some are Hindus, others Mahommedans in religion. In Bengal, amongst the richer classes, they permit infant marriage and forbid the marriages of widows. In Orissa, again, they adhere more to aboriginal customs; they hold, says Mr RISLEY, totems in reverence. Infant marriage is not essential, and widow marriage is allowed. They cremate the dead. They number from 4,000,000 to 5,000,000 of people.

Two crania of this caste have come under my observation; one, No. 598 in the Indian Museum, a male from the village Pittoria, near Ranchi, Chûta Nágpur; the other a female, presented to me by Dr HEDLEY WOOD, from Raipur in the Central Provinces. The general form in the *norma verticalis* was the elongated ovoid so frequently referred to in the preceding descriptions of the dolichocephalic crania of the aborigines; this form being associated with vertical sides and a rounded occipital squama. The length-breadth index in the man was 72·8, and the basi-bregmatic diameter exceeded the parieto-squamous; in the woman the index was 72; the basi-bregmatic height was much below the parieto-squamous diameter, and the parietal longitudinal arc was longer than the frontal. The forehead was not receding; the glabella and supra-orbital ridges were not prominent. The nasal bones were not projecting, and the bridge was flattened; the nasal spine of the superior maxillæ was moderate; a ridge marked off the floor of the nose from the incisive region of the upper jaw; the anterior nares were wide, and the index in each specimen was platy-rhine. In the Teli man, the upper jaw was orthognathous, in the woman prognathous. In the man the orbital index was microseme, in the woman mesoseme. In both, the palato-maxillary index was just within the brachyuranic group. In the woman's skull there were no osseous irregularities. The cranial capacity in the man was 1370 c.c.; in the woman it was only 1005 c.c.

## URIYÁ.

In addition to the crania described in the preceding part of this memoir, which are definitely associated with particular races, tribes, or castes, the Indian Museum contains a number of skulls from Orissa, marked in the catalogue Ooriá or Uriyá. Uriyá is a linguistic term, which expresses a particular derivative of Sanskrit. It is the mother tongue of a very large percentage, said to be 95·1 per cent., of the Hindu population of Orissa, of those who inhabit the plains as distinguished from the aborigines who live in the mountains, and the name of the language is given to the people who speak it. As the aborigines of this province speak either Dravidian or Kolarian, the Uriyá tongue of the Hindu population in Orissa contains a mixture of archaic forms and words derived from those languages. Uriyá-speaking people form a considerable proportion of the class of domestic servants in the north-east of India, which probably accounts for

the number of crania in the Indian Museum marked Uriyá, most of which had been obtained from the medical school of Calcutta.

I have examined thirty skulls from the Indian Museum, marked Uriyá in the list sent to me, and in addition I have received from my friend Major BANNERMAN, M.D., two specimens which he had collected at Baghmari village in Orissa.

The crania were by no means a homogeneous series, but varied materially in form and proportions, so that it would be impossible to draw up a description which would be generally applicable. If we take the proportion of length and breadth to guide us in our examination, we shall find that the crania can readily be arranged in three groups. The larger number, seventeen in all, have the length-breadth index below 75, and in form and proportions are dolichocephalic; in ten skulls the corresponding index is between 75 and 80, mesaticephalic; whilst in five crania this index was upwards of 80, brachycephalic.

*Dolichocephalic Series.*—Of the seventeen crania belonging to this group, fifteen were apparently males and two females. They were all adults, with perhaps two exceptions about 20 and 21 years of age. When examined in the *norma verticalis*, they were seen to be elongated and ovoid in outline, with side walls approaching the vertical and with no great difference between the frontal and parietal transverse diameters. The parietal eminences were fairly marked. As a rule, the sagittal line was not raised above the general plane of the vertex, and the slope from it to the parietal eminence was moderate. In the majority the parieto-occipital region sloped gently backwards and downwards, but in four specimens it was inclined more abruptly, and in three of these it showed a want of symmetry, as if modified by artificial pressure. In No. 232 this character was most distinct, and in it was also seen a transverse post-coronal depression, as if from wearing a tight band during infancy. In No. 42, the elongated form was exaggerated and the skull was hyper-dolichocephalic; the sagittal suture was unossified, but the right parieto-mastoid and adjoining parieto-squamous were closed. The mean cephalic index of the series was 72.2. The male skulls in the greatest length ranged from 171 to 194 mm., but the majority were between 180 and 187 mm. In the greatest breadth they ranged from 124 to 139 mm., but the majority were between 127 and 134 mm. In no specimen was the occipital arc the longest; in several, the frontal and parietal longitudinal arcs were equal or almost equal; in a few, the frontal materially exceeded the parietal, in others the proportion was reversed. The mean vertical index of the series was 75.4, and in only three crania was the basibregmatic height less than the greatest breadth. (Table VI.)

The glabella and supra-orbital ridges had, as a rule, but little prominence, though well marked in the man from Baghmari village. In the men the forehead was slightly receding, but in the women it was almost vertical. The nasion was only slightly depressed; as a rule, the bridge of the nose projected forwards, but in a few it was not prominent. The nasal spine of the superior maxillæ was distinct as a rule, and the floor of the nose was separated from the incisive region of the maxilla by a sharp ridge.

The nasal index in sixteen skulls ranged from 45·8 to 56, and the mean was 51·6, *i.e.*, mesorhine, to which 'group eight specimens belonged; of the remainder, two were leptorhine, and six were platyrhine. The projection of the upper jaw was orthognathous, the mean gnathic index of fifteen crania being 96·2; no specimen was prognathous, and only four were mesognathous. The orbits were measured in sixteen crania, and the mean index was 85·6, mesoseme, to which group eight specimens belonged; five specimens were microseme and only three were megaseme. The palato-maxillary index showed a great range of variation, and indicated marked differences in the relative length and breadth of the palate and alveolar arch; five specimens were dolichuranic, six were mesuranic, six were brachyuranic; in several specimens the palate had a high arch. The nasio-mental diameter was taken in only seven skulls, in five of which the proportion between that diameter and the interzygomatic breadth was chamæprosopic, in the remaining two, leptoprosopic.

The cranial sutures were simple and, as a rule, not ossified. In ten skulls the lambdoidal suture contained Wormian bones, and in one of these they were numerous. In seven crania an epipteric bone or bones was present either on one or both sides, but in none did the squamous-temporal and frontal directly articulate. No skull was metopic. In No. 414 the basi-cranial synchondrosis was not ossified, and the upper wisdom teeth were not erupted; in the right orbit a slender process of the orbital plate of the superior maxilla ascended between the os planum and the lachrymal to articulate with the frontal. I have previously recorded examples of this variation in human crania in Bush, Papuan, and Lushai skulls.\* Several specimens retained the infra-orbital suture. The muscular ridges and processes were not strongly marked. The skulls were cryptozygous. No specimen showed a paramastoid process, third condyl or auditory exostosis. In three crania the wisdom teeth had not appeared. The mean cranial capacity of fifteen male skulls was 1370 c.c., mesocephalic; and the range was from 1138 c.c. to 1660 c.c. The mean capacity of two female skulls was 1370 c.c.

*Mesaticephalic Series.*—Of the ten crania which belonged to this series, seven were apparently males and three females. They were all adult except No. 20, in which, though the wisdom teeth were erupted, the basi-cranial synchondrosis was not ossified.

Of these specimens, seven had a cephalic index between 75 and 77·5, whilst three ranged from 77·6 to 79·6. Those with the lower indices showed no great difference in the general form of the cranium from the dolichocephalic group, whilst those in the higher series approximated to the brachycephalic, to be next described. (Table VII.)

Two skulls were so steep and vertical in the parieto-occipital region as to give the impression that they had been artificially flattened. In four skulls the basi-bregmatic height was less than the greatest breadth; in three it was greater; in three they were equal. In all, the occipital longitudinal arc was less than either the parietal or frontal; in four the frontal exceeded the parietal; in four the opposite condition existed.

The glabella and supra-orbital ridges were moderate, but in No. 130 they were

\* *Trans. Roy. Soc., Edinburgh, 1899, vol. xxxix. p. 712.*

TABLE VI.

*Uriyá.—Dolichocephali.*

|  | Gopaul.<br>Cuttack.<br>Orissa. | Hurnah.<br>Orissa. | Bhuruth.<br>Orissa. | Hindu.<br>Uriyá. | Bhoobun.<br>Hinda.<br>Uriyá. | Bhuruth.<br>Uriyá. | Panoo.<br>Uriyá. | Bipoo.<br>Orissa. | Dudeah.<br>Orissa. | Uriyá.<br>Orissa. | Uriyá.<br>Orissa. | Uriyá.<br>Orissa. | Naran.<br>Hindu.<br>Uriyá. | Bozeunto.<br>Balasore.<br>Orissa. | Baghmari.<br>Orissa. | Uriyá.<br>Orissa. | Baghmari.<br>Orissa. |
|--|--------------------------------|--------------------|---------------------|------------------|------------------------------|--------------------|------------------|-------------------|--------------------|-------------------|-------------------|-------------------|----------------------------|-----------------------------------|----------------------|-------------------|----------------------|
|  | I.M.                           | I.M.               | I.M.                | I.M.             | I.M.                         | I.M.               | I.M.             | I.M.              | I.M.               | I.M.              | I.M.              | I.M.              | I.M.                       | I.M.                              | E.U.A.M.             | I.M.              | E.U.A.M.             |
| Collection number, . . .                     | 2                              | 149                | 54                  | 20               | 23                           | 32                 | 33               | 179               | 232                | 409               | 412               | 419               | 24                         | 42                                | ...                  | 414               | ...                  |
| Age, . . . . .                               | 28                             | 23                 | 45                  | 27               | 23                           | 38                 | 24               | 30                | 18                 | Ad.               | Ad.               | Ad.               | 65                         | 20                                | Ad.                  | Ab. 21            | Ad.                  |
| Sex, . . . . .                               | M                              | M                  | M                   | M                | M                            | M                  | M                | M                 | M                  | M                 | M                 | M                 | M                          | M                                 | M                    | F.                | F.                   |
| Cubic capacity, . . .                        | 1345                           | 1455               | 1308                | 1448             | 1350                         | 1305               | 1232             | 1300              | 1348               | 1660              | 1485              | 1138              | 1334                       | 1406                              | 1440                 | 1396              | 1130                 |
| Glabello-occipital length, . . .             | 181                            | 180                | 174                 | 187              | 177                          | 180                | 176              | 175               | 177                | 194               | 180               | 171               | 182                        | 186                               | 184                  | 182               | 168                  |
| Basi-bregmatic height, . . .                 | 143                            | 146                | 130                 | 140              | 130                          | 126                | 137              | 138               | 134                | 138               | 146               | 129               | 135                        | 136                               | 135                  | 138               | 122                  |
| Vertical Index, . . .                        | 79.0                           | 81.1               | 74.7                | 74.9             | 73.4                         | 70.0               | 77.3             | 78.9              | 75.7               | 71.1              | 81.1              | 75.4              | 74.2                       | 73.1                              | 73.4                 | 75.8              | 72.6                 |
| Minimum frontal diameter, . . . . .          | 92                             | 95                 | 90                  | 95               | 91                           | 89                 | 99               | 96                | 92                 | 97                | 91                | 95                | 101                        | 91                                | 99                   | 92                | 92                   |
| Stephanic, . . . . .                         | 106                            | 114                | 112                 | 109              | 109                          | 113                | 114              | 109               | 108                | 113               | 112               | 107               | 113                        | 106                               | 105                  | 109               | 102                  |
| Asterionic, . . . . .                        | 100                            | 100                | 100                 | 109              | 109                          | 99                 | 97               | 103               | 104                | 108               | 108               | 98                | 100                        | 98                                | 106                  | 96                | 95                   |
| Greatest parieto-squamous breadth, . . . . . | 127p.                          | 133a.              | 127a.               | 134a.            | 129p.                        | 133p.              | 127a.            | 130p.             | 128p.              | 139a.             | 132p.             | 127a.             | 129a.                      | 124p.                             | 134a.                | 123p.             | 125p.                |
| Cephalic Index, . . . . .                    | 70.2                           | 73.9               | 73.0                | 71.7             | 72.9                         | 73.9               | 72.2             | 74.3              | 72.3               | 71.6              | 73.3              | 74.3              | 70.9                       | 66.7                              | 72.8                 | 70.3              | 74.4                 |
| Horizontal circumference, . . .              | 495                            | 501                | 486                 | 516              | 488                          | 499                | 491              | 488               | 488                | 538               | 507               | 485               | 505                        | 502                               | 510                  | 500               | 464                  |
| Frontal longitudinal arc, . . .              | 130                            | 130                | 130                 | 137              | 129                          | 134                | 137              | 124               | 130                | 130               | 147               | 128               | 128                        | 138                               | 137                  | 135               | 128                  |
| Parietal " " " " " " " "                     | 130                            | 130                | 130                 | 139              | 128                          | 125                | 124              | 130               | 138                | 130               | 124               | 126               | 131                        | 142                               | 134                  | 134               | 116                  |
| Occipital " " " " " " " "                    | 110                            | 248                | 99                  | 116              | 113                          | 114                | 107              | 105               | 99                 | 127               | 110               | 99                | 109                        | 112                               | 109                  | 103               | 101                  |
| Total " " " " " " " "                        | 370                            | 378                | 359                 | 392              | 370                          | 373                | 368              | 359               | 367                | 387               | 381               | 353               | 368                        | 392                               | 380                  | 372               | 345                  |
| Vertical transverse arc, . . .               | 310                            | 314                | 298                 | 309              | 302                          | 303                | 308              | 300               | 302                | 320               | 322               | 288               | 302                        | 302                               | 306                  | 309               | 279                  |
| Length of foramen magnum, . . . . .          | 35                             | 35                 | 32                  | 33               | 34                           | 32                 | 33               | 34                | 31                 | 36                | 34                | 29                | 33                         | 35                                | 36                   | 35                | 31                   |
| Basi-nasal length, . . . . .                 | 106                            | 104                | 102                 | 101              | 94                           | 95                 | 102              | 102               | 101                | 111               | 107               | 98                | 102                        | 99                                | 101                  | 102               | 93                   |
| Basi-alveolar length, . . . . .              | 95                             | 96                 | 100                 | 98               | 94                           | 94                 | 98               | 97                | 96                 | 111               | 100               | 95                | ...                        | 96                                | 98                   | 97                | 93                   |
| Gnathic Index, . . . . .                     | 89.6                           | 92.3               | ...                 | 97               | 100                          | 98.9               | 96.1             | 95.1              | 95                 | 100               | 93.5              | 96.9              | ...                        | 97                                | 97                   | 95.1              | 100                  |
| Interzygomatic breadth, . . .                | 126                            | 133                | 124                 | 127              | 114                          | 123                | 126              | 128               | 130                | 133               | 125               | 123               | 125                        | 123                               | 131                  | 118               | 122                  |
| Internalar " " " " " " " "                   | 114                            | 116                | 112                 | 116              | 103                          | 111                | 116              | 120               | 118                | 121               | 112               | 113               | 115                        | 111                               | 120                  | 107               | 113                  |
| Nasio-mental length, . . . . .               | 124                            | 119                | ...                 | ...              | ...                          | ...                | ...              | 114               | 105                | ...               | ...               | ...               | ...                        | 108                               | 122                  | ...               | 104                  |
| Nasio-alveolar, . . . . .                    | 73                             | 66                 | 62                  | 66               | 62                           | 64                 | 65               | 66                | 60                 | 72                | 67                | 62                | ...                        | 64                                | 69                   | 59                | 56                   |
| Complete Facial Index, . . .                 | 98.4                           | 89.4               | ...                 | ...              | ...                          | ...                | ...              | 89                | 80                 | ...               | ...               | ...               | ...                        | 87.8                              | 93.1                 | ...               | 88.6                 |
| Nasal height, . . . . .                      | 51                             | 46                 | 46                  | 46               | 47                           | 49                 | 48               | 48                | 47                 | 51                | 51                | 46                | 53                         | 45                                | 50                   | 46                | 43                   |
| Nasal width, . . . . .                       | 24                             | 25                 | 26                  | 25               | 23                           | 24                 | 25               | 22                | 23                 | 28                | 26                | 24                | 27                         | 23                                | 28                   | 25                | 24                   |
| Nasal Index, . . . . .                       | 47.1                           | 54.3               | ...                 | 54.3             | 48.9                         | 49                 | 52.1             | 45.8              | 48.9               | 54.8              | 51                | 52.2              | 50.9                       | 51.1                              | 56                   | 54.3              | 55.8                 |
| Orbital width, . . . . .                     | 37                             | 36                 | 35                  | 38               | 36                           | 38                 | 38               | 37                | 37                 | 40                | 39                | 39                | 39                         | 38                                | 40                   | 37                | 35                   |
| Orbital height, . . . . .                    | 36                             | 33                 | 29                  | 32               | 31                           | 31                 | 29               | 32                | 32                 | 33                | 32                | 32                | 35                         | 33                                | 34                   | 32                | 30                   |
| Orbital Index, . . . . .                     | 97.3                           | 91.7               | ...                 | 84.2             | 86.1                         | 81.6               | 76.3             | 86.5              | 86.5               | 82.5              | 82                | 82                | 83.7                       | 8.8                               | 85                   | 86.5              | 85.7                 |
| Palato-maxillary length, . . .               | 53                             | 54                 | 55                  | 57               | 54                           | 53                 | 55               | 56                | 52                 | 63                | 54                | 55                | 51                         | 3                                 | 52                   | 52                | 50                   |
| Palato-maxillary breadth, . . .              | 65                             | 65                 | 62                  | 59               | 58                           | 57                 | 63               | 63                | 58                 | 71                | 57                | 68                | 60                         | 56                                | 70                   | 63                | 60                   |
| Palato-maxillary Index, . . .                | 120.7                          | 120.3              | 112.7               | 103.5            | 107.4                        | 107.5              | 114.5            | 112.5             | 111.5              | 112.7             | 105.5             | 123.6             | 117.6                      | 105.6                             | 134.6                | 121               | 120                  |
| Symphysial height, . . . . .                 | 33                             | 35                 | ...                 | 33               | 28                           | 28                 | 27               | 30                | 29                 | 36                | 31                | 29                | 27                         | 30                                | 37                   | 25                | 30                   |
| Coronoid " " " " " " " "                     | 69                             | 60                 | ...                 | 70               | 56                           | 67                 | 54               | 59                | 57                 | 62                | 58                | 61                | 66                         | 67                                | 60                   | 64                | 69                   |
| Condylod " " " " " " " "                     | 63                             | 60                 | ...                 | 67               | 57                           | 60                 | 54               | 63                | 52                 | 65                | 64                | 57                | 59                         | ...                               | 59                   | 50                | 69                   |
| Gonio-symphysial length, . . . . .           | 92                             | 85                 | ...                 | 89               | 79                           | 90                 | 87               | 92                | 84                 | 87                | 92                | 82                | 82                         | 87                                | 86                   | 84                | 87                   |
| Inter-gonial width, outside, . . .           | 105                            | 100                | ...                 | ...              | ...                          | ...                | ...              | 98                | 92                 | ...               | ...               | ...               | ...                        | 96                                | 98                   | ...               | 93                   |
| Breadth of ascending ramus, . . .            | 33                             | 32                 | ...                 | 38               | 29                           | 40                 | 33               | 35                | 29                 | 34                | 29                | 34                | 29                         | 34                                | 35                   | 33                | 33                   |



strongly marked. The forehead only slightly receded. The nasal bones were prominent and with usually a good bridge, but in No. 65 the bridge was flattened. The nasal spine of the superior maxillæ was moderate; in some specimens the nasal floor was separated from the incisive region by a ridge; in others, as in No. 65, they rounded off into each other. In seven specimens the nasal index was mesorhine; in one, leptorhine; in two, platyrhine. In six crania the upper jaw was orthognathous; in two, mesognathous, and in one, No. 65, prognathous. In six the orbital index was mesoseme; in three, microseme; in one, megaseme. As regards the relative length and breadth of the palato-alveolar arch, five specimens were mesuranic, one was dolichuranic, two were brachyuranic. The four crania in which the length of the entire face could be taken, were practically leptoprosopic or high faced.

The cranial sutures, as a rule, were simple; in four skulls, Wormian bones were present in the lambdoidal suture, and in one of these, No. 65, the right half of the upper occipital was an independent bone; in No. 415, two sutural bones were in the sagittal behind the obelion. In one skull on both sides, and in another on the left side, the squamous temporal articulated with the frontal; in three crania, epipteric bones were present, in two of these on both sides, in one on one side. Three skulls showed the infra-orbital suture. One skull, No. 98, was edentulous; in one, the teeth were stained with betel. No skull was metopic, or possessed a third condyl, paramastoid process or auditory exostosis. They were cryptozygous, and mostly rested behind on the occipital bone. The muscular ridges and processes were not strong. The mean cranial capacity in the men was 1336 c.c., and ranged from 1212 to 1530 c.c.; in the three women, the mean capacity was 1176 c.c.

*Brachycephalic Series.*—Five of the crania marked Uriyá were brachycephalic in form and proportions. Three were apparently males and two females. (Table VIII.)

In the *norma verticalis* the crania were rounded, and the male skulls, with one exception, had a less glabello-occipital length than the shortest male skull in the dolichocephalic group; whilst the female skulls were shorter than the female dolichocephalic Uriyás. The sagittal region was not ridged, and the crania generally were more flattened at the vertex than in the dolichocephali. The parietal eminences were prominent, especially in No. 38, and in the *norma occipitalis* the skulls had a pentagonal form. In four crania there was evidence of parieto-occipital flattening, more particularly in the hyper-brachycephalic skull, No. 417, in which the parieto-occipital region was almost vertical; the pressure had produced in two skulls an unsymmetrical projection to the right, and in two others to the left. In No. 38 the occipital region was rounded, and projected behind the inion. The cephalic index ranged from 80 to 88.2, and the mean was 83.7. In all, the occipital longitudinal arc was the shortest; in three, the frontal arc was longer than the parietal; in two, the parietal was the longer. In all, the basi-bregmatic diameter was less than the parieto-squamous, and the mean vertical index was 79.2.

The glabella and supra-orbital ridges were feeble; the forehead was almost vertical;

TABLE VII.

*Uriya.—Mesaticephali.*

|   | Matu.<br>Hindu.<br>Orissa. | Bho-<br>blance.<br>Hindu.<br>Orissa. | Gally.<br>Orissa. | Bassu.<br>Orissa. | Orissa. | Orissa. | Orissa. | Orissa. | Orissa. | Orissa. |
|---|----------------------------|--------------------------------------|-------------------|-------------------|---------|---------|---------|---------|---------|---------|
|   | I.M.                       | I.M.                                 | I.M.              | I.M.              | I.M.    | I.M.    | I.M.    | I.M.    | I.M.    | I.M.    |
| Collection number, . . .                        | 65                         | 76                                   | 98                | 130               | 199     | 413     | 415     | 410     | 416     | 418     |
| Age, . . . . .                                  | 20                         | 30                                   | 70                | 50                | 38      | Ad.     | Ad.     | Ad.     | Ad.     | Ad.     |
| *Sex, . . . . .                                 | M.                         | M.                                   | M.                | M.                | M.      | M.      | M.      | F.      | F.      | F. (?)  |
| Cubic capacity, . . .                           | 1260                       | 1212                                 | 1205              | 1530              | 1408    | 1336    | 1405    | 1270    | 1110    | 1150    |
| Glabello-occipital length, .                    | 174                        | 169                                  | 167               | 185               | 175     | 173     | 179     | 170     | 168     | 168     |
| Basi-bregmatic height, .                        | 132                        | 128                                  | 130               | 150               | 132     | 134     | 128     | 136     | 128     | 132     |
| Vertical Index, . . .                           | 75.9                       | 75.7                                 | 77.8              | 81.1              | 75.4    | 77.5    | 71.5    | 80.     | 76.2    | 78.6    |
| Minimum frontal diameter, .                     | 94                         | 95                                   | 88                | 100               | 98      | 94      | 90      | 91      | 91      | 88      |
| Stephanic, . . . . .                            | 114                        | 115                                  | 104               | 120               | 115     | 108     | 111     | 109     | 108     | 103     |
| Asterionic, . . . . .                           | 103                        | 95                                   | 102               | 115               | 98      | 104     | 105     | 101     | 90      | 102     |
| Greatest parieto-squamous<br>breadth, . . . . . | 137p.                      | 128p.                                | 133p.             | 141s.             | 135p.   | 134s.   | 135p.   | 132p.   | 128p.   | 128p.   |
| Cephalic Index, . . . .                         | 78.7                       | 75.7                                 | 79.6              | 76.2              | 77.1    | 77.5    | 75.5    | 77.6    | 76.2    | 76.2    |
| Horizontal circumference, .                     | 494                        | 480                                  | 475               | 518               | 493     | 495     | 500     | 480     | 472     | 470     |
| Frontal longitudinal arc, .                     | 120                        | 122                                  | 130               | 138               | 131     | 124     | 130     | 124     | 124     | 119     |
| Parietal " " }                                  | 243                        | 236                                  | 115               | 125               | 134     | 118     | 134     | 131     | 118     | 120     |
| Occipital " " }                                 |                            |                                      | 111               | 114               | 100     | 112     | 112     | 107     | 99      | 109     |
| Total " " . . .                                 | 363                        | 358                                  | 356               | 377               | 365     | 354     | 376     | 362     | 341     | 348     |
| Vertical transverse arc, .                      | 312                        | 285                                  | 309               | 319               | 315     | 298     | 308     | 303     | 293     | 295     |
| Length of foramen magnum, .                     | 29                         | 31                                   | 31                | 33                | 37      | 33      | 34      | 35      | 31      | 30      |
| Basi-nasal length, . . .                        | 97                         | 96                                   | 93                | 106               | 97      | 99      | 93      | 98      | 100     | 99      |
| Basi-alveolar length, . . .                     | 100                        | 97                                   | ...               | 95                | 96      | 95      | 88      | 94      | 91      | 95      |
| Gnathic Index, . . . .                          | 103.1                      | 101.                                 | ...               | 89.6              | 99.     | 96.     | 94.6    | 95.9    | 91.     | 98.     |
| Interzygomatic breadth, .                       | 124                        | 117                                  | 118               | 133               | 126     | 124     | 123     | 117     | 116     | 118     |
| Intermalar " " . . .                            | 116                        | 110                                  | 106               | 120               | 117     | 116     | 116     | 107     | 104     | 110     |
| Nasio-mental length, . . .                      | 109                        | 116                                  | ...               | 120               | 120     | ...     | ...     | ...     | ...     | ...     |
| Nasio-alveolar " " . . .                        | 61                         | 68                                   | ...               | 69                | 66      | 68      | 60      | 63      | 61      | 63      |
| Complete Facial Index, . .                      | 89.5                       | 99.                                  | ...               | 90.               | 95.     | ...     | ...     | ...     | ...     | ...     |
| Nasal height, . . . . .                         | 46                         | 50                                   | 43                | 52                | 50      | 49      | 46      | 46      | 46      | 47      |
| Nasal width, . . . . .                          | 23                         | 24                                   | 20                | 25                | 25      | 26      | 23      | 23      | 23      | 27      |
| Nasal Index, . . . . .                          | 50.                        | 48.                                  | 46.5              | 48.2              | 50.     | 53.1    | 50.     | 50.     | 50.     | 57.4    |
| Orbital width, . . . . .                        | 38                         | 37                                   | 36                | 39                | 39      | 37      | 37      | 36      | 38      | 38      |
| Orbital height, . . . . .                       | 31                         | 30                                   | 32                | 35                | 35      | 33      | 34      | 30      | 34      | 32      |
| Orbital Index, . . . . .                        | 81.6                       | 81.1                                 | 88.9              | 89.7              | 89.7    | 89.2    | 91.9    | 88.3    | 89.5    | 84.2    |
| Palato-maxillary length, .                      | 59                         | 53                                   | ...               | 52                | 56      | 54      | 51      | 53      | 49      | 52      |
| Palato-maxillary breadth, .                     | 63                         | 61                                   | ...               | 64                | 64      | 63      | 60      | 59      | 57      | 63      |
| Palato-maxillary Index, . .                     | 106.7                      | 115.                                 | ...               | 123.              | 114.3   | 116.6   | 117.6   | 111.3   | 116.3   | 121.    |
| Lower jaw. { Symphysial height, . .             | 28                         | 31                                   | ...               | 28                | 36      | 29      | 33      | 28      | 25      | 29      |
| Coronoid " " . . .                              | 56                         | 63                                   | 57                | 61                | 63      | 62      | 60      | 59      | 58      | 61      |
| Condylod " " . . .                              | 58                         | 66                                   | 58                | 66                | 63      | 59      | 56      | 48      | 52      | 54      |
| Gonio-symphysial length, .                      | 90                         | 83                                   | 72                | 97                | 87      | 80      | 87      | 85      | 76      | 81      |
| Inter-gonial width, outside,                    | 92                         | 91                                   | ...               | 105               | 90      | ...     | ...     | ...     | ...     | ...     |
| Breadth of ascending<br>ramus, . . . . .        | 42                         | 33                                   | 27                | 35                | 30      | 35      | 35      | 30      | 31      | 33      |

TABLE VIII.

*Uriyá.—Brachycephali.*

|  | Hindu.<br>Orissa. | Siplo.<br>Hindu.<br>Orissa. | Orissa. | Orissa. | Puttonez.<br>Hindu.<br>Cuttack,<br>Orissa. |
|--|-------------------|-----------------------------|---------|---------|--|
|  | I.M.              | I.M.                        | I.M.    | I.M.    | I.M.                                       |
| Collection number, . . . . .                 | 4                 | 129                         | 411     | 417     | 38   |
| Age, . . . . .                               | 20                | 32                          | Ad.     | ...     | 40   |
| Sex, . . . . .                               | M.                | M.                          | M.      | F.      | F.   |
| Cubic capacity, . . . . .                    | ...               | 1148                        | 1200    | 1118    | 1240                                       |
| Glabello-occipital length, . . . . .         | 173               | 161                         | 163     | 152     | 167  |
| Basi-bregmatic height, . . . . .             | 139               | 128                         | 126     | 126     | 127  |
| <i>Vertical Index</i> , . . . . .            | 80·3              | 79·5                        | 77·3    | 82·9    | 76·  |
| Minimum frontal diameter, . . . . .          | 82                | 90                          | 88      | 88      | 83   |
| Stephanic, . . . . .                         | 116               | 112                         | 109     | 106     | 104  |
| Asterionic, . . . . .                        | 106               | 97                          | 99      | 93      | 97   |
| Greatest parieto-squamous breadth, . . . . . | 140p.             | 138p.                       | 135p.   | 134p.   | 135p.                                      |
| <i>Cephalic Index</i> , . . . . .            | 80·9              | 85·7                        | 82·8    | 88·2    | 80·8                                       |
| Horizontal circumference, . . . . .          | 488               | 478                         | 473     | 452     | 466  |
| Frontal longitudinal arc, . . . . .          | 130               | 124                         | 131     | 117     | 118  |
| Parietal " " . . . . .                       | 128               | 117                         | 120     | 119     | 125  |
| Occipital " " . . . . .                      | 105               | 100                         | 99      | 92      | 112  |
| Total " " . . . . .                          | 363               | 341                         | 350     | 328     | 355  |
| Vertical transverse arc, . . . . .           | 314               | 302                         | 307     | 300     | 290  |
| Length of foramen magnum, . . . . .          | 37                | 29                          | 32      | 34      | 33   |
| Basi-nasal length, . . . . .                 | 101               | 96                          | 94      | 88      | 87   |
| Basi-alveolar length, . . . . .              | 95                | 96                          | 96      | 86      | 87   |
| <i>Gnathic Index</i> , . . . . .             | 94·1              | 100·                        | 102·1   | 97·7    | 100·                                       |
| Interzygomatic breadth, . . . . .            | 123               | 122                         | 120     | 110     | 115  |
| Intermalar " " . . . . .                     | 109               | 112                         | 109     | 100     | 102  |
| Nasio-mental length, . . . . .               | 109               | 96                          | ...     | ...     | 96   |
| Nasio-alveolar " " . . . . .                 | 62                | 60                          | 64      | 56      | 58   |
| <i>Complete Facial Index</i> , . . . . .     | 88·6              | 78·6                        | ...     | ...     | 83·4                                       |
| Nasal height, . . . . .                      | 48                | 48                          | 45      | 43      | 43   |
| Nasal width, . . . . .                       | 24                | 24                          | 24      | 19      | 22   |
| <i>Nasal Index</i> , . . . . .               | 50·               | 50·                         | 53·3    | 44·2    | 51·2                                       |
| Orbital width, . . . . .                     | 36                | 37                          | 33      | 34      | 36   |
| Orbital height, . . . . .                    | 31                | 30                          | 29      | 31      | 30   |
| <i>Orbital Index</i> , . . . . .             | 86·1              | 81·1                        | 87·9    | 91·2    | 83·3                                       |
| Palato-maxillary length, . . . . .           | 50                | 56                          | 58      | 49      | 48   |
| Palato-maxillary breadth, . . . . .          | 61                | 61                          | 60      | 56      | 58   |
| <i>Palato-maxillary Index</i> , . . . . .    | 122·              | 109·                        | 104·4   | 114·3   | 120·8                                      |
| Lower jaw. { Symphysial height, . . . . .    | 28                | 25                          | 33      | 30      | 24   |
| Coronoid " " . . . . .                       | 53                | 60                          | 58      | 53      | 60   |
| Condylod " " . . . . .                       | 51                | 59                          | 56      | 54      | 53   |
| Gonio-symphysial length, . . . . .           | 86                | 90                          | 81      | 73      | 78   |
| Inter-gonial width, outside, . . . . .       | 95                | 90                          | ...     | ...     | 79   |
| Breadth of ascending ramus, . . . . .        | 35                | 35                          | 34      | 28      | 28   |

the nasion was not depressed; the bridge of the nose was not very prominent; the nasal spine of the superior maxillæ was moderate; the floor of the nose in some specimens was separated from the incisive region by a sharp ridge. The mean nasal index was 49·7, mesorhine, to which group three specimens belonged: one was leptorhine, one platyrrhine. The mean gnathic index was 98·7, mesognathous, to which group three specimens belonged, but two were orthognathous. The mean orbital index was 85·9, mesosemæ, to which group two skulls belonged; one was megasemæ; two were microsemæ. The relative length and breadth of the palato-alveolar arch showed great variation: two skulls were dolichuranic; one mesuranic; two brachyuranic. In all the face was chamæprosopic.

No skull was metopic. The cranial sutures were simple. In two specimens the lambdoidal suture contained Wormian bones; in one there was a right epipteric bone; in two the infra-orbital suture was present. The crania were cryptozygous. The mean cranial capacity of two males was 1174 c.c., and of two females 1179 c.c.; each skull was microcephalic.

#### COMPARISON OF ABORIGINAL CRANIA.

Before proceeding to consider the relations, as regards race, which the Dravidian and Kolarian-speaking tribes bear to each other, it will be advisable to examine the evidence of the possible presence in India of a people more ancient even than the present wild tribes of the hill districts. From time to time objects have been found, which, from the material of their construction and the simplicity of the workmanship, would point to the existence in India of people who manufactured and employed tools and implements of stone.

In 1842 Dr W. H. PRIMROSE found at Lingsoo-goor,\* near a tumulus on which the mess-house of the Hyderabad contingent was built, knives and arrow heads made of cornelian, jasper, agate, and chalcedony.

In 1863 Mr R. BRUCE FOOTE discovered in the Madras Presidency, *in situ*, in beds of a red ferruginous clay mingled with sand and gravel, and at an elevation of 300 feet above the sea, chipped implements formed of quartzite.† Stone implements have also been obtained by other collectors in Orissa, Mirzapore, Jubhulpore, and the South Mahratta country. Although formed of quartzite and not of flint, Sir JOHN EVANS‡ considers that, as far as general form is concerned, they are identical with the implements from European river-drifts, and he regards them as belonging to palæolithic times. Mr F. SWYNNERTON § states that quartzite implements of palæolithic type have been found on the surface of the ground at Raipur.

Sir JOHN EVANS has recorded a worked arrow head from India in the possession of Professor BUCKMAN which belonged to the late Stone age. A number of arrow heads, with

\* MEADOWS TAYLOR in *Journ. Ethno. Soc.*, London, N.S., vol. i. p. 175, 1869.

† *Geological Magazine*, vol. xi. p. 503.

‡ *Ancient Stone Implements*, 2nd ed., p. 651, London, 1897.

§ *Journ. Anthro. Inst.*, 1899, vol. ii. p. 141.

stone beads, a celt, a perforated stone and other objects, formed of chert, chalcedony, rock crystal, and quartz have been found by Mr W. H. P. DRIVER at Ranchi in Chûta Nâgpûr. They have been described and figured by Professor J. WOOD-MASON.\* The place where they were found had obviously been a neolithic settlement. Mr SWYNNERTON has described roughly chipped fragments of jasper and chert in the gravel of the Sourrka river, from the alluvium of the plain in which the city of Gwalior is built.

We can scarcely expect to trace a direct continuity between the present aborigines and those prehistoric men who manufactured the primitive palæolithic implements. It is, however, worthy of consideration if some of the existing hill tribes may not be the descendants of the people of neolithic times.

Of the hill tribes referred to in the earlier pages of this memoir the Juangs are without doubt the most primitive. Colonel DALTON speaks decidedly on this point, and regards them as representatives of the Stone age. Until strangers came amongst them, they had no knowledge of metals, they had no word in their language to designate iron or other metals, and they employed implements made of stone. They could neither spin nor weave, nor had they the simplest knowledge of pottery. They wore no clothes but leaves, and were remarkably shy and timid. Although their language is in part Kolarian, like that of the Hos and Santals, they have many words which cannot be connected with the languages now spoken by other people in India, and the people themselves claim to be the autochthones in Keunjhar.

Like other primitive people they are of low stature; they have thick lips and, according to DALTON, coarse frizzly hair, though the two girls drawn from photographs in his great work do not support this statement, as the hair is long and wavy. The colour of the skin is not black, but reddish brown.

In an account which Dr SHORTT has given† of the Juangs, Juags, or leaf wearers of Orissa, met with by him in the tributary Mahals of Cuttach, he states that the head is well formed and globular, the forehead expanded, the cheek bones high, nasal ridge depressed and wide, lips fleshy, chin pointed, face triangular or wedge-shaped; eyes large and expressive, a character which scarcely conforms to the Mongolian type of countenance which he ascribes to the Juangs. The hair is copious and long on the head, moustache and beard scanty. He attaches importance to the large proportion of persons in whom the lower jaw is 'underhung.' The average stature of the men is 5 feet 1½ inches, of the women 5 feet.‡

If the two skulls in the Indian Museum which I have measured are genuine specimens of the Juang race, it will be seen that whilst the male is dolichocephalic, the index

\* *Journal Asiatic Soc. Bengal*, vol. lvii. part xi., 1888.

† *Journ. of Anthropol. Soc.*, p. cxxxvi. in *Anthropological Review*, vol. iii., 1865.

‡ M. J. WALHOUSE has described, *Journ. Anth. Inst.*, 1875, vol. iv. p. 369, a leaf wearing tribe, named Korâgar, in South Canara, on the western coast of India. The leaves are worn by the women, a survival, apparently, of a habit prior to the use of raiment, but outside the clothes. The people are black skinned, thick lipped, nose broad and flat, hair rough and bushy. The men, he says, seldom exceed in stature 5 feet 6 inches, but this is probably too high an estimate of their stature.

of the female is about the middle of the mesaticephalic group; both were orthognathous and platyrrhine. The breadth in the malar and zygomatic regions was not so great as to give the impression that the face was markedly broad; but from the absence of the lower jaw the proportion between the length and breadth of the entire face could not be obtained. The general dimensions of the woman's skull were small, and its cranial capacity, 1030, was in the lowest category of human skulls. In the man, however, the capacity was higher than is customary in the skulls of savage races. If we are to regard these people, and some of the primitive tribes in Southern India described by Mr EDGAR THURSTON, as præ-Dravidian, there is no evidence that they are Negritos.

It is customary, in speaking of the existing natives of India, to consider that they belong to four ethnic types—Mongolian, Kolarian, Dravidian and Aryan or Indo-Aryan. The possibility of the presence of a Negrito element should also be made the subject of enquiry.

The Mongolians or Tibeto-Burmans are found on the northern and eastern confines of India, and on the east of the Bay of Bengal. I have described representative people of this type in Part I. of this Memoir.\*

The Kolarians and Dravidians, on account of linguistic differences, have been by many writers regarded as two distinct ethnic types. It has been assumed that the Kolarian invaders had preceded the Dravidian, and had migrated into India through the north-east passes. The Dravidians, again, are stated to have found their way into the Punjab by the north-west passes, and to have spread into Central and Southern India, though others have conjectured that they came from the south and east.† They are regarded as older inhabitants than the Aryans, who are thought to have entered India, something more than 4000 years ago, from the Hindu Kush, the Pamir plateau, and the high valley of Cashmere. The aborigines of the hill districts in Southern India, the Central Provinces and the Lower Provinces of Bengal, have been described as in part Kolarians and in part Dravidians.

Mr B. H. HODGSON, in his essay on the Kocch, Bodo and Dhimal tribes,‡ uses the term Tamulian as equivalent to aboriginal, and, whilst the people of the sub-Himalayan district belong to the Tibetan stock, and those further east to the Chinese, he regards those to the south as Tamulian, and as represented by the Kols, Bhils, Gonds, Oraons and Mundas. He is of opinion that amongst the Tamulians the physical type is essentially the same in all the tribes.

During the last ten years, and principally through the influence of the writings of Mr H. H. RISLEY,§ the distinction between Kolarian and Dravidian-speaking tribes has come to be regarded as only linguistic, and not as representing differences in physical type. "The Málé of the Rahmahal hills," he says, "and the Oraons of Chota Nagpore, both of whom speak languages classed as Dravidian, are identical in point of physique

\* *Trans. Roy. Soc. Edin.*, vol. xxxix., 1899.

† Sir W. W. HUNTER'S *Indian Empire* and THURSTON'S *Madras Bulletin*, 1899, p. 195.

‡ Calcutta, 1847.

§ *The Tribes and Castes of Bengal*, 1891.

with the Mundas and Santals, who are classed on linguistic grounds as Kolarian." He does away with the term 'Kolarian' as having an ethnic significance, and he includes both sets of people under the common term 'Dravidian.' Mr RISLEY's conclusions were arrived at after a series of anthropological examinations and measurements, conducted under his supervision, on about 6000 living persons in Bengal, the North-Western Provinces and the Punjab. He defines the Dravidian type as follows:—Head usually inclined to be dolichocephalic; nose thick and broad, so that the formula of its platy-rhine index is higher than in any known race except the Negro; facial angle comparatively low; lips thick; face wide and fleshy; features coarse and irregular; average stature ranges from 156·2 to 162·1 cm. (5 feet 1 inch to 5 feet 3 inches); figure squat; limbs sturdy. The colour of the skin varies from very dark brown to a shade closely approaching black. The term Dravidian, as employed by RISLEY, has a similar meaning, as regards the tribes which it embraces, to the term Tamulian suggested by Mr HODGSON.

Mr RISLEY defines also the Aryan type in India, and as by contrast it brings out more clearly the Dravidian characters, I append it:—Head relatively long (dolichocephalic); nose straight, finely cut (leptorhine); face long, symmetrically narrow; forehead well developed, features regular; facial angle high; stature fairly high, ranging from 171·6 in the Sikhs (5 feet 7 inches) to 165·6 (5 feet 5 inches) in the Brahmins of Bengal; build of figure well proportioned, slender rather than massive. The colour of the skin is a very light transparent brown, though with various gradations.

I have had no opportunities of measuring the heads of living natives of India, but I propose to summarise the chief characters of the crania measured in Tables I.–IV. Unfortunately, some of the tribes are only sparsely represented, as regards the number of skulls, but the entire collection gives one a fair amount of material for comparison. The Gond, Oraon, Paharia, Karwar, Nagesar, Korwa and Bhuiya tribes, who are Dravidians in the earlier and restricted use of that term, contribute collectively fifteen crania.\* The Munda, Bhumi and Turi tribes belong to the old Kolarian group, and contribute collectively nineteen specimens.†

If we take the fifteen skulls in the first or proper Dravidian group, we find that the highest length-breadth index was 76·7. In six crania the index was below 70, hyperdolichocephalic; in five crania it was between 70 and 75, dolichocephalic; in four crania it was between 75 and 76·7, i.e., in the division of the mesaticephalic which approximates to the dolichocephalic group.‡ The customary type was therefore dolichocephalic.

\* I have not included in this number the two Bhima skulls, which possibly may be a sub-division of the Gonds, with which, in their form and proportions, they indeed closely correspond. As there may be a doubt as to their racial position, I thought it advisable to exclude them.

† I have not included in this number I.M. No. 407 (Table IV.), which is deformed from scaphocephalus, nor I.M. No. 604, Jattia Munda.

‡ I have discussed the relations of mesaticephalic skulls to dolichocephalic and brachycephalic crania in Part I. of this Memoir in *Trans. Roy. Soc. Edinburgh*, vol. xxxix. part iii. p. 744.

In the description which I have written of these crania, it is noted that in the *norma verticalis* they were elongated and ovoid; the sides vertical, or nearly so; the vertex roof-shaped, though not ridged in the sagittal region; the forehead only slightly receding; the parieto-occipital region not flattened, and the occipital squama rounded and projecting behind the inion. The muscular ridges and processes were not strong, so that the outer table was comparatively smooth, and the skulls were not characterised by their weight.

In nine crania the basi-bregmatic height exceeded the greatest breadth; in four the height was less than the breadth; in two they were equal. In these skulls, as is so frequently found in the dolichocephali, the height was usually greater than the breadth.

In the *norma facialis* the glabella and supra-orbital ridges were not prominent, and the nasion was not depressed. In seven specimens the anterior nares were wide in relation to their height, and the nasal index was platyrrhine; in six specimens the proportion of width was not quite so great and the index was in the mesorrhine group, but usually in its upper term; one specimen had a leptorrhine index which expressed a relatively narrow nose; the customary type was therefore platyrrhine. In seven specimens the upper jaw was orthognathous; in four, in the lower term of the mesognathous series; one specimen only was prognathic; the customary type of jaw, therefore, was orthognathic. In eleven skulls the orbit was microseme; in one, mesoseme; in three, megaseme; the orbit was usually low, therefore, in relation to its breadth. In the relative proportion of the length and breadth of the palato-alveolar arch only one specimen was dolichuranic; three were mesuranic, seven were brachyuranic; the type form therefore was that of a wide horseshoe. In the determination of the length and breadth of the entire face, the lower jaw was present in nine skulls, in seven of which the complete facial index was below 90, which places them in the chamæprosopic, or low-faced group, i.e., a face which is broad in relation to its length.

In Table II. I have given the cranial measurements of two Tamil-speaking male natives of Madras, who may be regarded as representing the south Dravidian branch. They were both dolichocephalic, and the height exceeded the breadth. The glabella and supra-orbital ridges, and the depression at the nasion, were somewhat more pronounced than in the skulls of the northern Dravidian tribes. In both, the upper jaw was orthognathous, the nose was platyrrhine, the orbit was microseme, and the palato-alveolar arch in one was mesuranic, in the other brachyuranic. In the skull with a lower jaw the face was chamæprosopic. The characters were distinctly Dravidian.

In the series of seventeen crania under analysis, including the Tamils but excluding those marked Kandh, the cubic capacity of thirteen male skulls ranged from 1438 to 1150 c.c., of which three were above 1400, three were between 1300 and 1400, six were between 1200 and 1300, and one was 1150 c.c.; the mean of the series was 1294 c.c. Of the four women, three were between 1200 and 1300, and one was only 1070; the mean of the series was 1217 c.c.



In making this analysis of the crania I have purposely excluded the two marked Kandh. In one of these the length-breadth index was 84·2, brachycephalic; in the other, 78·5. If the Kandhs are to be regarded as an unmixed Dravidian people, the high index in each instance leads one to think that the specimens may have been misnamed, and are not genuine examples of the race. If the tribe consists, however, as Dalton supposes, of a mixture of races, these crania, more especially the brachycephalic specimen, may indicate the presence of a brachycephalic strain, which intermingled with the Dravidian would tend to modify the original 'dolichocephalic type. It should be stated that the nasal index in each skull was platyrrhine, and in the brachycephalic specimen strongly so; the orbital index was microseme; the palato-maxillary index was brachyuranic; in neither was the upper jaw prognathic, and in the only one with a lower jaw the face was chamæprosopic. In the facial characters the skulls marked Kandh corresponded with the Dravidian type.

We may now proceed to the analysis of the skulls belonging to Kolarian-speaking tribes. One specimen, No. 604, Indian museum, marked Jattia Múnda of Bhowro village, near Ranchi, had a cephalic index, 80·5, but as in the configuration of the cranium it differed so much from the other Múndas I have excluded it from the general description. The following observations apply therefore to nineteen skulls.

In three crania the length-breadth index was below 70, *i.e.*, hyper-dolichocephalic; in fourteen specimens it was between 70 and 75, dolichocephalic; in two specimens, between 75 and 76, which, although not numerically, yet in form and essential characters were dolichocephalic. In general form, the crania were elongated and ovoid, with steep side walls, moderate parietal eminences, no special ridging in the sagittal region, and, with the slope outwards to the parietal eminences, not very steep. The forehead was not markedly receding, indeed often approaching the vertical; the parieto-occipital slope was gradual; the occipital squama was, as a rule, rounded, and projected behind the inion. The muscular ridges and processes were fairly marked, and the skulls had no unusual weight.

The basi-bregmatic height exceeded the greatest breadth in twelve crania; it was less than the breadth in six, and in one they were equal.

In the *norma facialis* the glabella and supra-orbital ridges moderately projected, and the nasion was only slightly depressed. In six specimens the anterior nares were wide, and the nasal index was platyrrhine; in ten specimens the nose was mesorhine, and in all of these, with one exception, with the index above 50; two specimens had a narrow leptorrhine index.\* In nine specimens the upper jaw was orthognathous; eight specimens were mesognathous; no face was prognathous. Ten specimens had a low microseme orbit; four were mesoseme; four had a high megaseme orbit. In no skull was the palato-alveolar arch so elongated as to be dolichuranic; three were mesuranic; the rest were brachyuranic. The lower jaw was present in eleven of the nineteen skulls,

\* It is not unlikely that in the living person the nose may have, on account of the lateral extension of the alæ, a more strongly marked platyrrhine character than would be obtainable from the width of the anterior nares in the skull itself.

in nine of which the proportion of the breadth to the length of the face was low or chamæprosopic; in the remaining two the complete facial index was 90 and 93 respectively, and the face was within the leptoprosopic division.

In the Kolarian group the cranial capacity of the men ranged from 1470 to 1176 c.c.; of these four were above 1400, five were between 1300 and 1400, six were between 1200 and 1300, and one was below 1200 c.c.; the mean of the series was 1314 c.c. The three women's skulls had a mean capacity of 1097 c.c., and the lowest measured only 1000 c.c.

If we compare the characters of the skull in the Dravidian with the Kolarian group, we shall find that they correspond in essential particulars. In both, the type of cranium in form and proportion was dolichocephalic; the anterior nares were platyrrhine, or in the higher term of the mesorrhine group; the presence of a leptorrhine index was altogether exceptional; the upper jaw was usually orthognathous; only one of the thirty-six skulls was prognathous; as a rule the orbit was low or microseme, the palato-alveolar arch was brachyuranic. In both groups also the face was chamæprosopic, *i.e.*, the interzygomatic width was great in proportion to the length of the face. If we take the cranial capacities of the two groups together, the men have a mean 1304 c.c., the women 1157 c.c.

Judging, therefore, from the characters of the skull, one would draw the conclusion that there is no difference of moment in the form and proportion of this part of the skeleton between the Dravidian and Kolarian types, and support is given to the view of their essential structural unity as advocated by Mr RISLEY. For descriptive purposes both groups of skulls may be classed therefore as Dravidian.

Many ethnologists of great eminence have regarded the aborigines of Australia as closely associated with the Dravidians of India. Some also consider the Dravidians to be a branch of the great Caucasian stock, and affiliated therefore to Europeans. If these two hypotheses are to be regarded as sound, a relationship between the aboriginal Australian and the European would be established through the Dravidian people of India.

The affinities between the Dravidians and Australians have been based upon the employment of certain words by both people, apparently derived from common roots; by the use of the boomerang, similar to the well-known Australian weapon, by some Dravidian tribes; by the Indian peninsula having possibly had in a previous geologic epoch a land connection with the Austro-Malayan Archipelago, and by certain correspondences in the physical type of the two people.

Both Dravidians and Australians have dark skins approximating to black; dark eyes; black hair, either straight, wavy, or curly, but not woolly or frizzly; thick lips; low nose with wide nostrils; usually short stature, though the Australians are somewhat taller than the Dravidians.

When the skulls are compared with each other, whilst they correspond in some particulars, they differ in others.\* In both races the general form and proportions are

\* I may refer to my *Challenger Report on Human Crania*, part xxix., 1884, for an analysis of the characters of the skulls of the Australian aborigines.

dolichocephalic, but in the Australians the crania are absolutely longer than in the Dravidians, owing in part to the prominence of the glabella. In the Australians it is not unusual for the adult male to have the glabello-occipital diameter approaching, or even a little more than, 200 mfn., whilst in the male Dravidians measured in Tables I.-IV. only two specimens reached 191 mm. The Australian skull is heavier, and the outer table is coarser and rougher than in the Dravidian; the forehead also is much more receding; the sagittal region is frequently ridged, and the slope outwards to the parietal eminence is steeper. The Australians in the *norma facialis*, have the glabella and supra-orbital ridges much more projecting; the nasion more depressed; the jaws heavier; the upper jaw usually prognathous, sometimes remarkably so; the teeth larger and coarser, so as to deserve the name macrodont. The coarser character of the skull, especially in the temporal region, the heavier jaws and the large strong teeth, point to the use of a coarser food by the Australians, for which a more powerful masticatory apparatus is required. On the other hand, both Australian and Dravidian crania have the nasal index platyrrhine or mesorrhine; the occurrence of a long, narrow, or leptorrhine nose being so exceptional, that its presence indicates that the skull has probably been incorrectly named, or is not of a pure race. In both races also the males have usually a microseme orbit; but whilst the Australians have customarily a long dolichuranic palato-alveolar arch, in the Dravidians it is broader in relation to the length, and frequently brachyuranic.

As regards the cranial capacity of the Australians, whilst the range in the thirty-nine male skulls which I have measured was from 1514 c.c. to 1044, the mean was only 1280 c.c., which is somewhat less than the general Dravidian mean 1314 c.c. In the female Australians, twenty-four women ranged from 1240 to 930, and had a mean 1115.6 c.c., which is also less than the Dravidian mean 1157 obtained from seven female crania. It should be stated that of the series of sixty-three Australian skulls, eight men were less than 1200 c.c., and only four above 1400 c.c.; whilst of the women only three were above 1200 c.c., and ten were below 1100 c.c.

By a careful comparison of Australian and Dravidian crania, there ought not to be much difficulty in distinguishing one from the other. The comparative study of the characters of the two series of crania has not led me to the conclusion that they can be adduced in support of the theory of the unity of the two people.

The skulls which belonged to the Koydwar, Kámár, Ahír-Goálá and Teli castes or tribes were dolichocephalic, platyrrhine, and, with one exception, orthognathic, characters which they shared with the Dravidian crania. It is not unlikely that in these castes there is a strong Dravidian element. The Bhima skulls, though dolichocephalic and either orthognathous or mesognathous, were not platyrrhine. The Bunjana skull, on the other hand, was hyper-brachycephalic, though the jaw was orthognathous, and the nose was platyrrhine. The Lohár skull was mesaticephalic and orthognathic, but the nasal index was leptorrhine, and in so far pointed to a predominance of Aryan blood. The

specimens were too few to enable one to draw a general conclusion on the cranial characters of these tribes or castes.

As already stated, the skulls of the Uriyá group presented considerable variations in the cephalic index, and in the configuration of the skull. In the dolichocephalic series about one-third were platyrrhine in the nasal index, the others were mesorrhine or leptorrhine; in the majority the upper jaw was orthognathous, and no skull was prognathous. In the mesocephalic series the majority were mesorrhine, only two were platyrrhine, and one was leptorrhine; the upper jaw was usually orthognathous, and only one was prognathous. The brachycephalic series was represented by only five specimens, three of which were mesorrhine, one platyrrhine, and one leptorrhine; as regards the upper jaw, no specimen was prognathous.

As many of these crania were derived by the Indian Museum from the Medical School in Calcutta, it may have happened that no proper history of the dead had been obtained, and that, in consequence, the skulls had not been accurately identified.\* If we grant that they had all belonged to the Uriyá-speaking people, the inference seems obvious that the community of language would by no means express unity of race.

It would seem, therefore, that in the Uriyás some crania partook of Dravidian, others of Aryan characters, and from the presence of a proportion of brachycephalic skulls, there might also have been a trace of Mongolian or other brachycephalic intermixture. As regards the Uriyá group, it is probable that a considerable Dravidian element is contributed through the presence of tribes of Hinduised aborigines, intermingled with the people who possess a strain of Aryan blood.

I will now proceed to the consideration of the Veddahs, the aboriginal hill tribe in Ceylon, of the Mincopies, the aborigines in the Andaman Islands, and of the hill tribes in the Malay peninsula.

#### *Veddahs.* TABLE IX.

In the study of the aboriginal dolichocephalic tribes in and near the Indian peninsula, we should not overlook the aborigines known as Veddahs or Weddas, who live in the hill districts of the adjoining island of Ceylon. Various travellers in Ceylon, of whom may be especially mentioned ROBERT KNOX,† JOHN DAVY,‡ C. PRIDHAM,§ Sir EMERSON TENNENT,|| B. F. HARTSHORNE,¶ JOHN BAILEY,\*\* and C. S. V. STEVENS,†† have given accounts of these people and the districts in which they live. GEORGE

\* The crania marked Uriyá, Orissa, in the Tables, are those which had been obtained from the Medical College. It will be seen that specimens so marked occur in each of the three groups tabulated in VI., VII., VIII.

† *Historical Relation of the Island of Ceylon.* London, 1817.

‡ *Account of the Interior of Ceylon and of its Inhabitants.* London, 1821.

§ *Ceylon and its Dependencies.* London, 1849.

|| *Ceylon.* London, 1859.

¶ *Fortnightly Review,* London, 1876, vol. xix.

\*\* *Trans. Ethnol. Soc.,* London, 1863.

†† *Overland Times of Ceylon,* Nov. 6th, 1886.

BUSK described four specimens of their crania in 1862,\* which, along with three others, had their chief measurements recorded by Sir WM. FLOWER in his catalogue of crania in the Hunterian Museum. MM. DE QUATREFAGES and HAMY figured a skull in the *Crania Ethnica*, Pl. LVIII. BARNARD DAVIS has also recorded, in the *Thesaurus Craniorum*,† the measures of ten Veddah skulls. GEORGE ROLLESTON exhibited to the British Association in 1872‡ photographs of jungle Veddahs, and also three skulls of this people in the Oxford Museum. VIRCHOW has described§ three Veddah skulls, and has discussed the ethnological relations of the people. ARTHUR THOMSON has given an account|| of the osteology of the Veddahs, and has described, along with the other bones of the skeleton, the characters of nine skulls in the Oxford Museum. He has also included in his tables of measurement three skulls measured by VIRCHOW, fifteen in the Museum of the Royal College of Surgeons of England, and eleven in the collection of BARNARD DAVIS. Much the most complete description of the habits, distribution, and physical characters of the Veddahs, and, indeed, of the natives generally of Ceylon, is contained in the monumental work on that island by PAUL and FRITZ SARASIN,¶ who record, in addition to an account of the skeleton generally, the measurements of eighteen male and four female skulls from the interior of the island, and four male and four female skulls from the coast districts; also some young and imperfect crania.

As regards the external physical characters of the Veddahs, the SARASINS have contributed the fullest and most carefully analytical description, which I have summarised as follows:—The colour of the face in men varies from a deep brown to one with shades of lighter brown; they have never seen a pure black skin, and those that seem to be black, when closely examined are distinctly brown. The skin of the breast is more frequently an opaque brown, though it may have a medium or reddish-brown shade. In women there is not the same range in the brown tint, and on the whole the skin is a clearer brown. The eyes have a brownish-black or opaque brown colour. The hair of the head is black, coarse, wavy, tangled, and hanging down to the shoulders or the back; that of the beard and moustache is black and sparse. On the body the hair is also sparse, though on the legs it may be abundant. The face is tolerably broad and not high, the mean index of sixteen men being 80·7, i.e., low-faced, chamæprosopic: the chin is pointed. The eyebrows are not strong, the eyes are generally large, and there is no fold of skin connecting the eyelids at the inner canthus (epikanthus), as in the Mongols. The nose has a deep pit in men at the root, the bridge is not strong, and the alæ have considerable breadth; in women the nose is flatter than in men. The lips are large and the jaws are orthognathic.

\* *Proc. Linn. Soc.*, 1862, vol. vi.

† *Thesaurus Craniorum*, 1867.

‡ *Scientific Papers and Addresses*, vol. i., Oxford, 1884, edited by W. Turner.

§ "Ueber die Weddas von Ceylon," *Abh. der K. Akad. der Wiss. zu Berlin*, 1881.

|| *Journ. Anth. Inst.*, Nov. 1889.

¶ *Ergebnisse naturwissenschaftlicher Forschungen auf Ceylon*, 3d Band, *die Weddas von Ceylon*. Wiesbaden, 1892–93.

The stature is low; in the Veddahs of the central district, where the race is probably the purest, the mean height of twenty-four men was 1533 mm. (5 feet  $\frac{1}{3}$  inch), of eleven women 1433 mm. (4 feet 7 inches); that of twenty-four men from the coast district was 1588 mm. (5 feet 2 inches), of ten women 1494 mm. (4 feet 9 inches), whilst fourteen men from the district of Wewatte were 1607 mm. (5 feet  $2\frac{3}{4}$  inches) in height. In the sea-coast, and Wewatte districts there has probably been some intermixture with Singhalese, Tâmlis, or even Indo-Arabians, which would affect both the stature and other physical characters of the Veddahs.

As regards the Dravidian Tamils of Ceylon, the SARASINS have also described their external physical characters. They are a bigger people than the Veddahs; the mean stature of the men was 1653 mm. (5 feet 4 inches) and of the women 1545 mm. (5 feet  $\frac{3}{4}$  inch). The pigmentation of the skin was deeper in the lower than the higher castes. In about one-half the men examined the skin of the face was a medium, rarely a red-tinted, brown; in the other half a brighter brown shading into yellow: in the women a more opaque brown prevailed. The eyes were an opaque brown. The hair was black and scarcely differed from the hair of the Veddahs, though it was perhaps coarser and had a greater tendency to curl. The supra-orbital region was often well developed in the men. The face was oval and proportionately higher and narrower than in the Veddahs. The eyes were large and without an epikanthus. The nose had a stronger bridge than in the Veddahs, and the alæ were not so wide. The lips were thick. The teeth were strongly developed, and the jaws were more projecting than in the Veddahs.

I have examined and measured nine Veddah crania which have not previously been described. Three of these belonged to the Henderson Trust Collection, now in the Edinburgh University Museum; they were presented in 1827 by the Rev. G. LYON and were probably the earliest examples of the race to reach this country. One was presented to me about twenty years ago by the late Dr KRIEKENBECK of Colombo; the man had died in jail; the skull is metopic, a rare condition in dolichocephalic savages. One from Batticaloa, in the east of Ceylon, was presented by H. THWAITES, Esq. In one skull, No. 555 in the Indian Museum, the face was broken. Of the three others, two have been for some years in the Museum of Trinity College, Dublin, and another, also in Dublin, came from Batticaloa. I have to thank Professor CUNNINGHAM for permission to examine them. The skulls were all adults; to all appearance seven were men and two probably women.

When examined in the *norma verticalis* the crania were seen to be elongated antero-posteriorly; the side walls were almost vertical; the vertex in some specimens was roof-shaped, but not keeled in the sagittal region, and in others the vertex was more flattened; the parietal eminences were distinct. The skull sloped gently backwards as a rule into the occipital region, and the occipital point usually projected definitely behind the inion; there was no evidence of parieto-occipital flattening. In three of the skulls the length-breadth index ranged from 66.5 to

TABLE IX.

*Veddah.*

|  | HENDERSON TRUST. |       |       | E.U.A.M.    |          | I.M.  | TRINITY COLLEGE, DUBLIN. |       |             |
|--|------------------|-------|-------|-------------|----------|-------|--------------------------|-------|-------------|
|  | 143              | 145   | 144   | Batticaloa. | Metopic. | 555   | ...                      | ...   | Batticaloa. |
| Collection number, . . . . .                 | Ad.              | Ad.   | Ad.   | Ad.         | Ad.      | Ad.   | Ad.                      | Ad.   | Ad.         |
| Age, . . . . .                               | M.               | M.    | F.    | M.          | M.       | M.    | M.                       | M.    | F.          |
| Sex, . . . . .                               | ...              | 1226  | 1090  | 1090        | 1100     | 1170  | 1262                     | 1362  | 1088        |
| Cubic capacity, . . . . .                    | 177ap.           | 170   | 174   | 167         | 180      | 180   | 175                      | 185   | 174         |
| Glabello-occipital length, . . . . .         | 130              | 129   | 131   | 127         | 126      | 130   | 137                      | 139   | 127         |
| Basi-bregmatic height, . . . . .             | 73.4             | 75.9  | 75.3  | 76.         | 70.      | 72.   | 78.                      | 75.   | 73.         |
| Vertical Index, . . . . .                    | 93               | 87    | 88    | 93          | 93       | 91    | 93                       | 94    | 89          |
| Minimum frontal diameter, . . . . .          | 108              | 104   | 100   | 98          | 99       | 96    | 109                      | 113   | 100         |
| Stephanic, . . . . .                         | 103              | 98    | 99    | 97          | 100      | 103   | 98                       | 101   | 101         |
| Asterionic, . . . . .                        |                  |       |       |             |          |       |                          |       |             |
| Greatest parieto-squamous breadth, . . . . . | 125ap.           | 128s. | 121p. | 127s.       | 121s.    | 128s. | 125s.                    | 123s. | 127s.       |
| Cephalic Index, . . . . .                    | 70.6             | 75.3  | 69.5  | 76.         | 67.      | 71.   | 71.4                     | 66.5  | 73.         |
| Horizontal circumference, . . . . .          | 492ap.           | 478   | 475   | 477         | 500      | 497   | 490                      | 510   | 485         |
| Frontal longitudinal arc, . . . . .          | ...              | 123   | 120   | 120         | 120      | 130   | 130                      | 132   | 120         |
| Parietal " " . . . . .                       | 130              | 123   | 128   | 111         | 130      | 128   | 122                      | 145   | 110         |
| Occipital " " . . . . .                      | 104              | 105   | 110   | 113         | 114      | 112   | 112                      | 110   | 113         |
| Total " " . . . . .                          | ...              | 356   | 353   | 341         | 363      | 372   | 364                      | 387   | 343         |
| Vertical transverse arc, . . . . .           | 292              | 288   | 281   | 289         | 278      | 292   | 295                      | 302   | 288         |
| Length of foramen magnum, . . . . .          | 37               | 34    | 33    | 32          | 29       | 35    | 34                       | 33    | 32          |
| Basi-nasal length, . . . . .                 | 94               | 91    | 97    | 97          | 98       | 96    | 97                       | 101   | 100         |
| Basi-alveolar length, . . . . .              | 96               | 89    | 88    | 98          | 100      | ...   | 92ap.                    | 90ap. | 93          |
| Gnathic Index, . . . . .                     | 102.1            | 97.8  | 90.7  | 101.        | 102.     | ...   | 94.8                     | 89.   | 93.         |
| Interzygomatic breadth, . . . . .            | 131              | 120   | 111   | 129         | 121      | ...   | 126                      | 117   | 123         |
| Intermalar " " . . . . .                     | 117              | 109   | 103   | 116         | 116      | ...   | 112                      | 108   | 113         |
| Nasio-mental length, . . . . .               | ...              | ...   | ...   | 107         | 117      | ...   | ...                      | ...   | ...         |
| Nasio-alveolar " " . . . . .                 | 59               | 56    | 55    | 66          | 64       | ...   | 52                       | 60    | 58          |
| Complete Facial Index, . . . . .             | ...              | ...   | ...   | 82.9        | 96.7     | ...   | ...                      | ...   | ...         |
| Nasal height, . . . . .                      | 43               | 44    | 42    | 45          | 46       | ...   | 42                       | 45    | 44          |
| Nasal width, . . . . .                       | 25               | 23    | 26ap. | 22          | 22       | ...   | 25                       | 23    | 25          |
| Nasal Index, . . . . .                       | 58.1             | 52.3  | 61.9  | 48.9        | 47.8     | ...   | 59.5                     | 51.   | 56.8        |
| Orbital width, . . . . .                     | 41               | 36    | 37    | 38          | 36       | 36    | 39                       | 38    | 35          |
| Orbital height, . . . . .                    | 29               | 30    | 32    | 31          | 30       | 30    | 31                       | 34    | 33          |
| Orbital Index, . . . . .                     | 70.7             | 83.3  | 86.5  | 81.6        | 83.      | 83.   | 79.5                     | 89.5  | 94.3        |
| Palato-maxillary length, . . . . .           | 50               | 50    | 47    | 54          | 54       | ...   | 52                       | 45ap. | 50          |
| Palato-maxillary breadth, . . . . .          | 66               | 58    | 53    | 64          | 63       | ...   | 56                       | 57    | 63          |
| Palato-maxillary Index, . . . . .            | 132.             | 116.  | 112.7 | 118.5       | 116.6    | ...   | 107.9                    | 126.6 | 126.        |
| Lower jaw. { Symphysial height, . . . . .    | ...              | ...   | ...   | 28          | 33       | ...   | ...                      | ...   | ...         |
| { Coronoid " " . . . . .                     | ...              | ...   | ...   | 65          | 61       | ...   | ...                      | ...   | 58          |
| { Condylod " " . . . . .                     | ...              | ...   | ...   | 59          | 61       | ...   | ...                      | ...   | 48          |
| { Gonio-symphysial length, . . . . .         | ...              | ...   | ...   | 90          | 95       | ...   | ...                      | ...   | 88          |
| { Inter-gonial width, . . . . .              | ...              | ...   | ...   | 82          | 82       | ...   | ...                      | ...   | 80          |
| { Breadth of ascending ramus, . . . . .      | ...              | ...   | ...   | 33          | 34       | ...   | ...                      | ...   | 39          |

69.5, hyperdolichocephalic; in four the index was from 70.6 to 73, dolichocephalic; in the remaining two it was 75.3 and 76. The mean of the series was 71.1. In seven skulls the basi-bregmatic diameter exceeded the greatest breadth; in two they were equal: the mean vertical index of the series was 74.3. In one skull the occipital longitudinal arc was a little longer than the parietal, but not so long as the frontal arc; in four skulls the frontal arc exceeded the parietal; in three the opposite condition was seen. With one exception the crania were cryptozygous.

When looked at in the *norma lateralis*, the glabella and supra-orbital ridges projected only slightly, the forehead was sometimes nearly vertical, at others receded a little. The nasion was depressed in one specimen, but not in the others. The nasal bones were usually small, not prominent and concave forwards. The nasal spine of the superior maxillæ was distinct, and the floor of the nose was separated from the incisive region by a ridge. The mean nasal index was 54.4 platyrrhine, and of the individual skulls four were markedly platyrrhine, three were mesorrhine, and one on the boundary between leptorrhine and mesorrhine. The orbits varied in the relation of width and height; six were low, microseme; two were high, megaseme; one was mesoseme; the mean index, 83.5, was microseme. In no specimen was the upper jaw prognathous, five were orthognathous, and three were mesognathous; the mean gnathic index, 96.3, was orthognathous.

The nasio-mental diameter could be measured in only two skulls, in one of which the complete facial index was chamaeprosopic, in the other high-faced or leptoprosopic. The mean palato-maxillary index was 119.5, i.e., brachyuranic, and with two exceptions, one dolichuranic, the other mesuranic, the other skulls belonged to the brachyuranic group.

The teeth had been fully erupted in all the skulls except a wisdom tooth in No. 143; the crowns were mostly betel stained, and the grinding surfaces of the molars were worn flat. The sutures were, as a rule, distinct, and one was metopic; though in one the sagittal was partially obliterated. In two crania the lambdoidal suture contained small Wormian bones. One had a right epipteric bone, but in none was the squamous temporal in articulation with the frontal.

The cranial capacity in both sexes was low, the mean of six men was only 1201 c.c., and the range was from 1090 to 1362 c.c.; the mean of two women was only 1089 c.c. The lower jaw was present in only three specimens, in each of which the chin was well marked; the body of the bone was deep, for the lodgment of the fangs of the teeth and the angle was well marked.

I may now briefly state the chief cranial characters of the specimens described by previous observers. ARTHUR THOMSON has embodied in a table the measurements made by BUSK, VIRCHOW, FLOWER, BARNARD DAVIS, and himself. Of the thirty-seven skulls included in that table fourteen had a length-breadth index below 70, fourteen were between 70 and 75, five were from 75 to 77.5, one was 78, and three were from 80.6 to 82.9. All the skulls, with four exceptions, were definitely dolichocephalic or in the lower terms of the mesaticephalic group. Of the four exceptional specimens,



one with the index 82.9 from Bintenne of Badulla (R.C.S. Eng. No. 676) is said to be unsymmetrically distorted from occipital pressure, which had doubtless affected the relation of length to breadth; another, from Batticaloa, measured by Virchow, with an index 80.6, is said to be evidently abnormal, probably from an artificial or accidental deformity in the occipital region.

This series of skulls confirms what I have previously had occasion to point out in the study of crania, that in the dolichocephalic crania of savage races the basi-bregmatic height usually exceeds the greatest breadth. Thus, of thirty-six skulls in THOMSON'S table, in which both breadth and height are recorded, the height exceeded the breadth in thirty-one, and it was equal to the breadth in one specimen. In only four crania was the height less than the breadth, and in three of these the length-breadth index was above 80, and the skull was brachycephalic.

The seventeen skulls in THOMSON'S table in which the proportions of the upper jaws were measured were all orthognathous. Of the twenty-two skulls in which the proportions of the nose were measured, ten were platyrhine, seven were mesorhine, and only five were leptorhine. The orbital index was variable; in six specimens it was microseme, in eight mesoseme, in eight megaseme. The palato-alveolar index in eight skulls measured exceeded 120 in only one specimen.

As regards the cranial capacity it is difficult to make a precise statement, as the methods used by different observers in its determination were not uniform, and the results cannot be strictly compared with each other. It may suffice to state that the capacity in one woman's skull is said to be as low as 960 c.c.; in eleven other women the range of capacity was 1025 to 1442 c.c., and the mean was 1230 c.c., *i.e.*, microcephalic. In twenty men the range was from 1140 to 1611 and the mean was 1336 c.c., also microcephalic. In both sexes the mean was materially higher than in the skulls which I measured, and several skulls exceeded considerably that with the highest capacity, 1362 c.c. in my series, an excess which may perhaps partly be due to the methods employed yielding a larger result than is obtained by the plan which I am in the habit of following, which I believe to be more exact.\*

If we now examine the series of thirty skulls measured by the Messrs SARASIN, we find that the mean length-breadth index of the Veddahs from the interior was 70.5 for seventeen men, and 69.1 for four women; whilst the corresponding index of four men from the coast was 76.5, and of four women 73. No skull was brachycephalic, but in five the index was from 75.9 to 79.8. In each group, except in that of the men from the coast, the height exceeded the breadth. The mean complete facial index in each group was near the upper limit of the chamæprosopic division. The mean gnathic index in each group was orthognathous, and no specimen was prognathous, and only a small minority was mesognathous. The mean nasal index was in the higher mesorhine series; only four specimens were leptorhine, but thirteen were platyrhine. Fifteen specimens were

\* I have described my method in *Challenger Reports*, part xxix. p. 3, 1884. By the method of BROCA, followed by so many craniologists, the capacity is overstated.

megaseme, and the mean orbital index of the series came just within the megaseme division, but four specimens were microseme. In the relative proportions of the length and breadth of the palato-alveolar arch the mean index fell just within the brachy-uranic division. As regards the cranial capacity, the mean of twenty-two men was 1277 c.c., and of ten women 1139 c.c.

Seventy-six skulls ascribed to Veddahs have now been studied and described by experienced craniologists. With very few exceptions they were elongated, with the sides approaching the vertical, the sagittal line not keeled, or only slightly so; relatively narrow, and the length-breadth index was dolichocephalic, frequently hyperdolichocephalic. It is known that some of the skulls in which the index exceeded 75 or 76 were from natives who had lived on the coast, where the possibility of an admixture of blood with other races is probable. The basi-bregmatic height in almost every case exceeded the greatest breadth.

The face was broad in relation to the height. The nose was platyrrhine or mesorrhine, seldom leptorrhine. The upper jaw was orthognathous. The orbit was variable in the proportions of height and breadth, but tended to a relatively high vertical diameter. The palato-alveolar arch was moderately elongated. The cranial capacity was low.

If these characters be compared with those previously given, as found in the Dravidian group, they will be found to correspond in many respects. In both the crania were dolichocephalic in form and proportions; in both the height as a rule exceeded the breadth. The glabella and supra-orbital ridges did not strongly project, the forehead was not specially retreating, and in many specimens approached the vertical; the occipital squama was usually convex, and projected behind the inion. The face was low in relation to the breadth; the nasion was seldom much depressed; the anterior nares were platyrrhine or mesorrhine, rarely leptorrhine; the upper jaw was orthognathous, occasionally mesognathous, not prognathous; the orbits varied in the proportion of width and height; the palato-alveolar arch also varied, though the index seldom much exceeded 120, and the breadth was not greatly in excess of the length. The cranial capacity was microcephalic in both Veddahs and Dravidians, though the former were, on the whole, of smaller capacity than the latter. It is difficult, therefore, to lay down a series of characters in which the Veddah and Dravidian skulls differed from each other.

#### *Andaman Islanders.* TABLE X.

I have stated on p. 101 that the possibility of the presence of a Negrito element in the people of India has to be enquired into. Considerable attention has been given to this subject by several ethnologists, and opinions both affirmative of and adverse to the affinity between the black races of India and the Negritos have been expressed. Mr O'DONNELL in his *Census Report* has indeed used the term Negritic as if it were synonymous with Dravidian, and has indicated (p. 264) a route along which he thinks a

Negrito race could have reached southern India and passed to south-eastern Asia and Australia.

That a Negrito race is scattered in the Philippine Islands is well established, and that similar people exist in other islands of the great eastern Archipelago, and in a few localities on the adjacent continent, has been asserted by eminent authorities. There can be no doubt that the Mincopies, or natives of the Andaman Islands in the Bay of Bengal, have the Negrito characters of low stature, very dark skin approaching black, with woolly or frizzly black hair growing in short, close curls. The proximity of these islands to the Indian peninsula has seemed to indicate that a Negrito population had preceded in India the present dark-skinned Dravidian race, and that traces of their existence can be still found in the aboriginal people. Although some writers have referred to black, frizzly or woolly-haired tribes in certain of the mountainous districts in India, the evidence on this head is by no means conclusive, and it may be a question if the terms woolly or frizzly may not have been loosely used to characterise the wavy hair which has been seen in individuals of some of the aboriginal tribes. The statements which have been made in regard to this question have been carefully analysed by A. B. MEYER, in his *Memoir on the Distribution of the Negritos*,\* and he has come to the conclusion that the present state of our knowledge does not permit a judgment to be given that the aboriginal people of India were Negritos. As bearing on this matter, I may state that DALTON, in his *Ethnology of Bengal*, figures a Santal with curly hair, quite distinct, however, from the short, close locks of the natives of the Andaman Islands. In his portraits of the Juangs and Korwás, two tribes short in stature and primitive in habits, the hair is long, more or less matted, but not curly. Messrs FORBES WATSON and Sir J. W. KAYE have reproduced † photographs of a Santal, Kurumbas, Yenadies, a jungle tribe of Chingleput, a Toda and a Kandh with curly tangled hair. EDGAR THURSTON, in his description of the short, broad-nosed tribes of Southern India, figures Kadirs from the Ānaimalai Hills, in whom the hair was curly, relatively long, and projecting from the head, not unlike the "mop" of the Papuans. He also gives portraits of Paniyans from Malabar and Kurumbas from the Nilgiri Hills, in whom the hair had a similar character. These tribes or races are primitive in their habits, and the stature does not apparently exceed 5 feet 2 inches. Wavy and curly black hair are, he says, in the south Dravidians common types; but he had seen no head of hair to which the term woolly could be correctly applied.‡ The wavy or curly character seems to be no more marked than the curly locks not unfrequently seen in the white races.

I need not dwell upon the physical characters and the customs of the people of the Andaman Islands, as they have been described in considerable detail by J. MOUAT,§ E. H. MAN,|| DE QUATREFAGES,¶ and E. S. BRANDER.\*\*

\* Dresden, 1899.

† *The People of India*, 10 vols., 1868, c. s. London. India Museum.

‡ *Madras Bulletin*, vol. ii. No. 3, p. 187, 1899.

§ *Adventures in Andaman Islands*. London, 1861.

|| *Journ. Anthropol. Inst.*, xiv., 1885.

¶ *Les Pygmées*, Paris, 1887; and in conjunction with M. Hamy, *Crania Ethnica*, p. 184.

\*\* *Proc. Roy. Soc. Edin.*, 1880, p. 415.

The University Anatomical Museum contains the skulls of six Andaman Islanders, presented, along with other bones of the skeleton, by Drs J. DOUGAL, J. S. FORRESTER, D. D. CUNNINGHAM, and Colonel CADELL, V.C. In the Museum of the Royal College of Surgeons of Edinburgh is another skeleton.\* Of the seven skulls, two had not quite reached maturity; the others were adult, of these three apparently were women and two men,

When looked at in the *norma verticallis* the skulls were seen to be flattened at the vertex, and the vault had a low curve; they were relatively wider in the parietal regions, the eminences in which were distinctly marked even in the men's skulls. The stephanic diameter was much below the parietal, and its relatively short breadth contributed to give a characteristic contour to the cranium. Although there was no appearance of parieto-occipital flattening, the slope behind the obelion was somewhat abrupt, and the parietal eminences were much closer to the occipital than to the frontal pole of the cranium. With one exception the skulls were cryptozygous. The crania ranged in length from 173 to 158 mm., in greatest breadth from 141 to 128 mm. The mean length-breadth index was 81.5, brachycephalic, and the range was from 78.6 to 88.7. In each skull the basi-bregmatic height was, as is customary in brachycephalic crania, distinctly less than the greatest breadth, and the mean vertical index was 75.7. With one exception the occipital longitudinal arc was the shortest, but there was no constancy in the relative proportions of the frontal and parietal arcs.

In the *norma lateralis* the glabella and supra-orbital ridges were feeble in the males and scarcely marked in the female skulls; the forehead was vertical in the women and very slightly receding in the men; the frontal eminences were distinct. The nasion was not depressed, the nasal bones were not prominent except in one specimen, and were flattened across the bridge. In two skulls the nasal index was mesorhine, the rest were platyrhine, and the mean index was 55. One orbit was high in relation to the width, three were much lower, and the others were intermediate, the mean index of the series, 85.5, was mesorhine. The upper jaw in its degree of projection was in two cases orthognathous, in one prognathous, in the rest mesognathous, the mean of the series was 99.8, mesognathous. The face in each specimen was chamæprosopic, and the mean complete facial index was 80.5.

The nasal spine of the superior maxillæ was moderate, and the floor of the nose was usually separated from the incisive region by a ridge. The teeth had mostly erupted, but in some of the specimens the wisdoms were not complete, and in one of these the right upper canine and right lower central incisor were concealed in the jaws. In the older skulls the crowns were worn from use. In the younger skulls the sutures were well denticulated, but in the older they were beginning to be obliterated. One was metopic, and in it the frontal transverse diameters much exceeded those in the other skulls. In one specimen a large Wormian bone constituted the upper part of the

\* The bones of five of the skeletons, exclusive of the skulls, were described by me in the *Challenger Reports*, Zoology, vol. xvi. part xlvii., 1886.

TABLE X.

*Andaman Islanders—Sakai.*

|  |                                    | ANDAMAN ISLANDERS.        |       |         |       |       |       |          | SAKAI.       |         |  |  |
|--|------------------------------------|---------------------------|-------|---------|-------|-------|-------|----------|--------------|---------|--|--|
|  |                                    | Edin. Univ. Anat. Museum. |       |         |       |       |       | E.R.C.S. | Ed. U. A. M. |         |  |  |
|  |                                    | No. 6                     | No. 1 | No. 5   | No. 2 | No. 3 | No. 4 | ...      | Kampar.      | Pahang. |  |  |
| Collection number, . . .                     |                                    | No. 6                     | No. 1 | No. 5   | No. 2 | No. 3 | No. 4 | ...      | ...          | ...     |  |  |
| Age, . . . . .                               |                                    | Ad.                       | 21?   | Ad.     | Ad.   | Ad.   | 23?   | Ad.      | Ad.          | Ad.     |  |  |
| Sex, . . . . .                               |                                    | M.                        | M.    | M.      | F.    | F.    | F.    | F.       | M.           | M.      |  |  |
| Cubic capacity, . . .                        |                                    | 1080                      | 1255  | 1270    | 1080  | 1190  | 1153  | 1090     | 1155         | 1385    |  |  |
| Glabello-occipital length, .                 |                                    | 153                       | 159   | 173     | 166   | 161   | 159   | 164      | 169          | 175     |  |  |
| Basi-bregmatic height, .                     |                                    | 125                       | 123   | 127     | 122   | 119   | 125   | 121      | 130ap.       | 134     |  |  |
| Vertical Index, . . .                        |                                    | 79.1                      | 77.4  | 73.4    | 73.5  | 73.9  | 73.6  | 73.8     | 76.5         | 76.6    |  |  |
| Minimum frontal diameter, .                  |                                    | 89                        | 90    | 102     | 90    | 88    | 90    | 87       | 91           | 94      |  |  |
| Stephanic, . . . . .                         |                                    | 100                       | 111   | 122     | 107   | 104   | 109   | 99       | 95           | 106     |  |  |
| Asterionic, . . . . .                        |                                    | 97                        | 102   | 96      | 99    | 95    | 97    | 91       | 99           | 106     |  |  |
| Greatest parieto-squamous breadth, . . . . . |                                    | 128p.                     | 141p. | 136p.   | 131p. | 130s. | 131p. | 132p.    | 126s.        | 139s.   |  |  |
| Cephalic Index, . . .                        |                                    | 81.                       | 88.7  | 78.6    | 78.9  | 80.7  | 82.4  | 80.5     | 74.6         | 79.4    |  |  |
| Horizontal circumference, .                  |                                    | 462                       | 468   | 493     | 475   | 468   | 465   | 467      | 473          | 505     |  |  |
| Frontal-longitudinal arc, .                  |                                    | 115                       | 113   | 123     | 111   | 121   | 117   | 112      | 112          | 120     |  |  |
| Parietal " " . . .                           |                                    | 115                       | 102   | 135     | 113   | 113   | 120   | 125      | 127          | 128     |  |  |
| Occipital " " . . .                          |                                    | 102                       | ...   | 103     | 111   | 103   | 100   | 101      | 108          | 111     |  |  |
| Total " " . . .                              |                                    | 332                       | 345   | 361     | 335   | 337   | 337   | 338      | 347          | 359     |  |  |
| Vertical transverse arc, .                   |                                    | 288                       | 300   | 304     | 291   | 288   | 295   | 270      | 276          | 295     |  |  |
| Length of foramen magnum, .                  |                                    | 29                        | 31    | 32      | 33    | 29    | 34    | 30       | 36           | 37      |  |  |
| Basi-nasal length, . . .                     |                                    | 90                        | 83    | 94      | 93    | 90    | 89    | 92       | 93           | 98      |  |  |
| Basi-alveolar length, . . .                  |                                    | 91                        | 82    | 91      | 90    | 91    | 89    | 96       | 89           | 93ap    |  |  |
| Gnathic Index, . . . .                       |                                    | 101.1                     | 98.8  | 96.8    | 96.8  | 101.1 | 100.  | 104.3    | 96.7         | 94.9 ap |  |  |
| Interzygomatic breadth, .                    |                                    | 121                       | 112   | 128     | 123   | 118   | 115   | 119      | 116          | ...     |  |  |
| Intermalar breadth, . . .                    |                                    | 113                       | 103   | 118     | 112   | 106   | 103   | 111      | 108          | ...     |  |  |
| Nasio-mental length, . . .                   |                                    | 99                        | 92    | 103     | 96    | 88    | 92    | ...      | ...          | ...     |  |  |
| Nasio-alveolar " " . . .                     |                                    | 58                        | 53    | 62      | 59    | 54    | 55    | 56       | 40           | ...     |  |  |
| Complete Facial Index, .                     |                                    | 82.                       | 82.1  | 80.4    | 78.   | 74.5  | 80.   | ...      | ...          | ...     |  |  |
| Nasal height, . . . . .                      |                                    | 43                        | 40    | 45      | 43    | 41    | 41    | 44       | 41           | 51      |  |  |
| Nasal width, . . . . .                       |                                    | 22                        | 20    | 24      | 25    | 21    | 23    | 25       | 24           | 26      |  |  |
| Nasal Index, . . . . .                       |                                    | 51.2                      | 50.   | 53.3    | 58.1  | 51.2  | 56.1  | 56.8     | 58.5         | 51.     |  |  |
| Orbital width, . . . . .                     |                                    | 37                        | 35    | 37      | 36    | 37    | 37    | 36       | 36           | ...     |  |  |
| Orbital height, . . . . .                    |                                    | 32                        | 32    | 32      | 30    | 30    | 31    | 31       | 28           | ...     |  |  |
| Orbital Index, . . . . .                     |                                    | 86.5                      | 91.4  | 86.5    | 83.3  | 81.1  | 83.8  | 86.1     | 78.          | ...     |  |  |
| Palato-maxillary length, .                   |                                    | 50                        | 47    | 50      | 52    | 49    | 50    | 53       | 47           | ...     |  |  |
| Palato-maxillary breadth, .                  |                                    | 62                        | 56    | 64      | 60    | 53    | 56    | 59       | 59           | ...     |  |  |
| Palato-maxillary Index, .                    |                                    | 124.                      | 119.1 | 128.    | 115.4 | 108.1 | 112.  | 111.3    | 125.         | ...     |  |  |
| Lower jaw.                                   | Symphysial height, . . .           | 26                        | 22    | 23      | 23    | 23    | 25    | 24       | ...          | ...     |  |  |
|  | Coronoid " " . . .                 | 59                        | 49    | 49      | 53    | 53    | 51    | 55       | ...          | ...     |  |  |
|  | Condylod " " . . .                 | 54                        | 53    | 51      | 52    | 47    | 47    | 51       | ...          | ...     |  |  |
|  | Gonio-symphysial length, . . . . . | 85                        | 77    | 91      | 85    | 85    | 80    | 89       | ...          | ...     |  |  |
|  | Inter-gonial width, . . .          | 85                        | 80    | 94      | 82    | 76    | 78    | 84       | ...          | ...     |  |  |
|  | Breadth of ascending ramus, . . .  | 31                        | 27    | 35      | 34    | 37    | 36    | 35       | ...          | ...     |  |  |
|  |                                    |                           |       | Metopic |       |       |       |          |              |         |  |  |

**occipital squama.** One skull had an epipteric bone on each side; another had on the left side a broad articulation of the squamous temporal with the frontal, and on the right both an epipteric bone and a direct temporo-frontal articulation. In one the os planum of the ethmoid was so narrowed in front that the orbital plate of the maxilla almost articulated with the frontal; this specimen approached therefore the condition of direct fronto-maxillary articulation, such as I have previously referred to on page 94. In three skulls indications of an infra-orbital suture were present. The lower jaw had a feeble chin and shallow symphysis, the vertical diameter of the body of the bone was moderate, the coronoid process was short, and the sigmoid notch shallow. The cubic capacity of the crania was small; the males ranged from 1080 to 1270, with a mean 1202 c.c.: the females from 1080 to 1153, with a mean of 1106 c.c.

Although OWEN and BUSK had described a few crania, the late Sir WM. FLOWER made the most extensive research into the characters of the Andaman skull that has yet been conducted. He described\* a series forty-eight in number, six of which were metopic, and as one of my specimens had the same character, it is obvious that a persistent frontal suture is not uncommon in the crania of this race. The mean length-breadth index of his specimens was 82·8. The height was less than the breadth, and the length-height index was 77·7. The mean gnathic index was 100 in the men, 102 in the women. The mean nasal index was 51·1, and the orbital index, though variable, had a mean 90·9. Both in FLOWER's series and in mine the length-breadth index was brachycephalic; the height was distinctly below the breadth; the upper jaw was mesognathous; the nasal index was mesorhine or platyrhine; the orbits were mesoseme or megaseme; the cranial capacity was microcephalic. The number of specimens examined is so large as to justify one in saying that the leading characters of the cranium in these people have now been ascertained.

The series of Dravidian crania described in this Memoir differ in essential particulars from those of the Andaman Islanders, and the eye at once recognises the differential features, both in form and proportion. The measurements made by Mr THURSTON of the heads of the hill tribes in the Madras Presidency have shown the great majority to have a length-breadth index below 75, though a few ranged from 75 to 77·5; the south Dravidians, like those further north, have, therefore, heads of dolichocephalic proportions. Did we accept the view that a brachycephalic Negrito people preceded the Dravidians in the occupation of India, we could not, I consider, regard the latter, either in cranial configuration or external physical characters, as the direct descendants of the former. It might be argued that had there been a previous Negrito people, some amount of intermixture in times past of the two races might have taken place, which might have led to the production of a wavy or curly character of the hair such as has been seen in the tribes referred to on p. 114, and to the occasional presence of a skull tending to

\* *Journ. Anthropol. Inst.*, Nov. 1879, vol. ix., and Nov. 1884.

brachycephalic proportions in some of the existing aboriginal Dravidian tribes, but the direct evidence of either a past or a present Negrito population in India has yet to be obtained.\*

*Sakai.* TABLE X.

The name Sakai is given to aboriginal people dwelling in the hill regions in the Malay peninsula. Since the early part of the century certain tribes called Semangs have been described in Kedah to the north of Pinang and in Tringânû on the east coast. ANDERSON speaks of a native of Kedah as 4 ft. 6 in. in height, the hair woolly and tufted, the skin jet black, the lips thick, the nose flat, the belly protuberant as in the Andaman Islanders. J. R. LOGAN states that a tribe of Semangs in the hills opposite Pinang have a stature from 4 ft. 8 in. to 4 ft. 10 in., the nose with depressed root and spreading alæ, the skin dark brown though sometimes lighter, but black where most exposed.† The Russian traveller, v. MIKLUCHO-MACLAY, became acquainted with people named Orang Sakai in his journey through Johore in 1874-75. He stated that the hair consisted of very fine curls, arranged in a compact mass projecting for a short distance from the head, and formed a good guide to the purity of the race.‡ He regarded the people as Melanesians, though they approached the Negritos of the Philippines. The height of the men varied from 1450 to 1650 mm. (4 ft. 7 in. to 5 ft. 4 in.), and the heads were mesocephalic to brachycephalic. M. DE QUATREFAGES figured § from photographs natives, said to be Sakais from Perak, in one of whom the hair was smooth and in two others was frizzled. Mr ABRAHAM HALE has seen the Sakai people in the Kintah district of Perak, and has given an account|| of many of their customs. He states that an ancient race the Semangs are also found in Perak, on the right bank of the Perak river, whilst the Sakais inhabit the left bank.

HALE did not describe the physical characters of the Sakai, but stated that their primitive dress consisted of bark cloth twisted round the waist and drawn between the thighs. The nasal septum was pierced to wear a porcupine quill or a bone, and the ears were often pierced. The women had the hair standing out from the head in a great mop; they wore bracelets, and ornamented the face and breast with red figures. The Kelantan Sakais from the north-east were finer-looking men than those in the Kintah district.

At the instigation of Professor VIRCHOW, Mr VAUGHAN STEVENS travelled in the eastern

\* After this Memoir was in type I received, through the courtesy of Major BANNERMAN, M.D., the *Madras Christian College Magazine* for September and October 1900, in which is an article by Mr C. HAYAVADAWA RAU, B.A., on the origin of the Servile Classes and Hill Tribes of South India. In this article Mr RAU discusses, from the physical, social, linguistic and intellectual points of view, the Negrito theory of the origin of the Dravidians, and regards the theory as untenable. He draws the inference that all the indigenous tribes found by the Aryan immigrants in Southern India belonged substantially to one and the same Dravidian race.

† These accounts are abstracted in G. W. EARL'S work on the Native Races of the Indian Archipelago, London, 1883.

‡ *Verh. der Berliner Ges. für Anth.*, etc., 1876 and 1891, p. 837; *Journ. of Straits Branch of Royal Asiatic Soc.*, 1878.

§ *Les Pygmées*, Paris, 1887, pp. 54, 55.

|| *Journal of Anth. Institute*, vol. xv. p. 285, 1886.

part of the Malay peninsula. He sent to Berlin specimens of the hair of a tribe which he called Blandass or Belendas, a name which he seems to use as synonymous with Sakai.\* VIRCHOW states that the hair varied in length from 59 to 26 cm.; it was ebony in colour, the more slender examples being paler, and in a child pale reddish brown. In no specimen was it curly or spirally twisted, though at the tip it bent into a crescentic form. At a later date STEVENS forwarded specimens of the hair and a skull from the Panghan tribe (Panggan), on the east side of the peninsula. The men cut the hair close to the scalp, but left a 'tuft at the top of the occiput. The tuft was said to be of 'peppercorn' shape, and only 5 to 10 mm. above the scalp. The hair was black, slender and spirally twisted as in the Negrito, and could at once be distinguished from the hair of the Belendas tribe. The Semang tribe of Perak on the western side have apparently a similar tuft of hair, possessing the same character. VIRCHOW figures the skull, which was short, broad and high, hypsibrachycephalic; the length-breadth index being 81.5, the length-height 76.9. The glabella and supra-orbital ridges were prominent. The face was broad and low, chamæprosopic; the orbital index 80, was microseme; the nose was short, with a low bridge, mesorhine; the upper jaw was strongly prognathic; the cranial capacity was 1370 c.c.

In 1897 Dr R. MARTIN undertook a journey through the Malay peninsula with the object of seeing the wild tribes in the interior.† He distinguished the appearance of the Semangs, who live especially in the north and in part in the Siamese provinces, from the Sakais, who are found especially in Perak, Selangor, and the west of Pehang. The Semangs, he says, had black skins, black frizzled hair, and were doubtless closely allied to the Negritos of the Philippines. In the Sakai the skin of the breast and body was reddish brown in tint, whilst on the face it was a medium brown with yellowish brown shades; the hair was black, but with a brownish shimmer in certain lights, and throughout was wavy, which distinguished it from the frizzled hair of the Semang, and from the stiff hair of all Mongols, including the Malays. The stature of the Sakai men averaged about 1500 mm. (4 ft. 9 in.), that of the women 1420 mm. (4 ft. 6 in.). The head, from numerous measurements, had a mean length-breadth index 79; the face was broad, but pointed at the chin, mesoprosopic in its proportions, the nose had slight projection, but with broad alæ, which were deeper than the septum; the tegumentary part of the lips, especially the upper, was thick. They painted the face and breast with red, white and black spots, put hollow cylinders of bamboo into the ears and filled them with grasses, which formed a green frame around the face of the women. The men bored the nasal septum and passed through it a piece of wood or porcupine quill.

I am indebted to Mr NELSON ANNANDALE, who travelled in 1899 in the northern part of the peninsula, for photographs of a Sakai youth aged about 15, who lived in the Aring district, a hilly country in Kelantan, in the centre of the peninsula. He had

\* *Verh. der Berliner Ges. für Anth.*, etc., November 1891, July and October 1892.

† *Mitteil. der Naturwiss. Ges. in Winterthur*, Heft ii., 1900.



been captured by the Malays as a child, and had been circumcised and brought up as a Mahomedan. His skin was dark, approaching black; the forehead was almost vertical, the nose was short, with a low flattened bridge and wide alæ, the upper lip was thick and prominent, the facial configuration was negroid, but the hair, instead of being woolly or frizzled, was straight, and apparently three or four inches long.

In March 1891 I received from my former pupil, the late Dr W. DUNNAN SCOTT, an imperfect skeleton, which he believed to be that of a Sakai, with a letter giving an interesting account of the people. Dr SCOTT had accompanied his chief, Mr ABRAHAM HALE, in his visit to a tribe of Sakais inhabiting the hill-tops above the Kintab river at a place called Tanjang Keukong. Dr SCOTT is the officer referred to by Mr HALE in the appendix to his account of these people.\* Dr SCOTT writes as follows:—The Sakais occupy the hill country in the Malay peninsula as far south as the north end of Johore. The skull and bones were found in a valley watered by the Kampar river, a tributary of the Kintab river, about 25 miles from Batu Gajah. The hills are inhabited by scattered groups of Sakais. The bones were found on a rude platform, about 6 feet from the ground, in a lean-to hut under the shelter of a hill. The hut was made of boughs of trees, and the bones were further protected by a sort of cage of branches.†

The Sakais, he says, were an active, well-proportioned people, with stout muscular limbs, and of a sturdier make than the Malays. Their stature was probably on the average about 5 feet 2 inches, though some may be 5 feet 3 or 4 inches. The skin was lighter in colour than in the Malay, and but little deeper in tint than in the Chinese, though rather brown than yellow, and those who lived in the hills were lighter than those who occupied the low ground. The features, on the whole, were broad, but not markedly so, and the lips were not especially thick. The hair was black, and in those seen by Dr SCOTT was inclined to be long, wavy, reaching to the shoulders; but in some tribes he says that it was stiff, slightly curled, and stood out like a mop around the head, whilst in the people who lived more to the south it was in short corkscrew-like curls. The eyes, as far as he recollects, were dark brown. The gait was peculiar, with a step and swing from the hip.

The younger women wore the Malay sarong round the waist and over the breasts; the older women were generally content with a sarong or piece of bark cloth or fringe of fibrous roots around the waist, and with necklaces of shells, seeds, or monkeys' teeth. The men wore a loin-cloth made of bark, and on festive occasions they wound a strip of bark round the head. Many of the men ornamented the face with a white patch on the cheek, and the girls had the face covered with red and brown streaks. They carried on the back a light basket of rattan to hold fruit or small animals taken in the jungle. They obtained iron choppers, or parangs, from the Malays, but could not smelt the

\* *Journ. Anthropol. Inst.*, vol. xv. p. 299, 1886.

† Mr NELSON ANNANDALE has kindly given me photographs which he took of a Sakai rock shelter in Patalung which resembles the hut described by Dr SCOTT.

ore. Their weapons were spears of bamboo and the sumpitan with poisoned darts. Dr SCOTT also wrote an account of their religion, houses, dances, etc., but as this closely corresponded with the description already in print by Mr HALE, it is unnecessary to reproduce it.

The skull presented to me by Dr SCOTT is, I think, that of a man, apparently about middle life; the lower jaw is unfortunately absent.

In the *norma verticalis* the outline was broadly ovoid, with almost vertical side walls, not ridged, but flattened in the sagittal region; the parietal eminences were not prominent, and the skull was without the marked disproportion between the breadth of the frontal and parietal regions seen in the Andaman crania. The length-breadth index was 74·6, and the skull was dolichocephalic. The vertical index was 76·5, and the height was more than the breadth. The parietal longitudinal arc was much the longest. A shallow, vertical-transverse constriction, as if from the pressure of a band during infancy, was immediately behind the coronal suture. The parieto-occipital slope passed gradually downwards, and the occipital squama was rounded.

The glabella and supra-orbital ridges were distinct but not excessive, the forehead only slightly receded, and the frontal eminences were not prominent. The nasion was a little depressed; the nasal bones were small, concave forwards, and projected feebly at the tip. The nasal spine of the superior maxillæ was short. The anterior nares were wide, and the nasal index, 58·5, was strongly platyrrhine. The floor of the nose and the incisive region of the jaw were separated by a shallow ridge. The upper jaw was orthognathous. The orbital index, 78, was microseme. Although the absence of the lower jaw prevented the complete facial index being taken, the short nasio-alveolar diameter, as compared with the interzygomatic breadth index, 34·5, gave a low chamæprosopic character to the face. The palato-maxillary region was broad in relation to the length, and the index was 125.

The teeth were not much worn, though several had been lost during life, and the sockets were absorbed; their crowns were smaller than in the Andaman Islanders. The sutural denticulations were short and relatively simple. A small Wormian bone was in the left parieto-mastoid suture, and in the left pterion was a large epipterice bone. The left jugal process was tuberculated. The mastoids were feeble, and the skull rested behind on the posterior border of the foramen magnum. The cranium was phænozygous. The cranial capacity was microcephalic.

From the examination of the bones of the skeleton, especially those of the limbs, it was evident that the person had been of low stature. The atlas was the only true vertebra which reached me.

*Pelvis.*—It was small in general dimensions: the alæ were not expanded or very translucent: the pectineal lines were not knife-like: the præ-auricular sulcus was distinct. The sacrum had a feeble anterior concavity: its index, 102, was platyhieric, but the length was almost equal to the breadth. The conjugate diameter of the pelvic brim was distinctly greater than the transverse, and the brim index, 108·5, was highly

dolicho-pellic. The highest indices which I had previously recorded\* were in a male Australian 116, a male Bushman 109, and a male Malay 105. The highest brim index in the male Andaman pelvis which I have measured was 102. The want of expansion in the iliac fossæ was shown by the small breadth between the crests of these bones. The width of the pubic arch, with its angle  $80^\circ$ , gave a feminine aspect to the pelvis which led me at first to doubt, notwithstanding the cranial characters, if the skeleton were that of a male. Of the numerous pelvis which I have measured in the female sex, no specimen up to this time has shown the conjugate diameter to exceed the transverse, whilst in the males of savage races this is not unfrequent. In the Sakai pelvis the conjugate was so much in excess that I regard it as confirmatory evidence of the skeleton being of the male sex. I may also state that in a male pelvis in each of the following races I have measured the subpubic angle as follows:—Andaman,  $78^\circ$ ; Chinese,  $76^\circ$ ; Malay,  $76^\circ$ ; Bush,  $72^\circ$ .

*Measurements of Pelvis.*

|  | mm.        |
|--|------------|
| 1. Breadth of pelvis, . . . . .                        | 211        |
| 2. Height of pelvis, . . . . .                         | 164        |
| 3. <i>Breadth-Height Index</i> , . . . . .             | 77·7       |
| 4. Between ant. sup. iliac spines, . . . . .           | 193        |
| 5. Between post. sup. iliac spines, . . . . .          | 80         |
| 6. Between ischial tubera, . . . . .                   | 126        |
| 7. Vertical diameter of obturator foramen, . . . . .   | 38         |
| 8. Transverse diameter of obturator foramen, . . . . . | 31         |
| 9. <i>Obturator Index</i> , . . . . .                  | 81·6       |
| 10. Subpubic angle, . . . . .                          | $80^\circ$ |
| 11. Transverse diameter of brim, . . . . .             | 106        |
| 12. Conjugate diameter of brim, . . . . .              | 115        |
| 13. <i>Pelvic or Brim Index</i> , . . . . .            | 108·5      |
| 14. Intertuberal diameter, . . . . .                   | 107        |
| 15. Depth of pelvic cavity, . . . . .                  | 72         |
| 16. Length of sacrum, . . . . .                        | 94         |
| 17. Breadth of sacrum, . . . . .                       | 96         |
| 18. <i>Sacral Index</i> , . . . . .                    | 102        |

*Upper Limb.*—The Clavicles were slender bones, feebly curved, and with faintly-marked grooves for the subclavius muscles. The right bone was 120 mm., the left 123 mm. long. The Scapulæ were small in their dimensions, with well-marked muscular impressions indicative of strong muscles; the axillary border was concave in its long diameter, the supra-scapular notch was shallow. The right bone was 122 mm. long and 83 broad, its scapular index was 68; the left bone was 123 mm. long and 80 broad, its index was 65. The mean index of the two scapulæ was 66·5, which is less than the mean of 69·8 obtained by FLOWER and GARSON from twenty-one scapulæ of Andaman Islanders, and of 70·6 by myself from six scapulæ of that race. The Humeri had strong muscular impressions and distinct musculo-spiral grooves; no intercondylar

\* *Challenger Report on Human Skeletons*, part xlvii., 1886.

foramen or supra-condylar process was present. The bones of the forearm, though short, were well-proportioned and with distinct muscular impressions, but the styloid processes were feeble.

The dimensions were as follows :—

|                            | Right.  | Left.   |
|----------------------------|---------|---------|
| Humerus, head to trochlea, | 253 mm. | 246 mm. |
| Radius to tip of styloid,  | 203 "   | 201 "   |
| " base "                   | 200 "   | 199 "   |
| Ulna to tip of styloid,    | ...     | 222 "   |
| " articular surface,       | ...     | 222 ..  |

The radio-humeral index was 80·2, or dolichokerkic,\* a proportion which these bones have in common with the Andaman Islanders and with the Negritos measured by MEYER and TÜNGEL and by HAMY, which expresses that the forearm was in its relation to the upper arm proportionately longer than is found in Europeans.

*Lower Limb.*—The right femur, tibia, fibula and tarsal bones had been sent to me. The Femur, though small, was well-proportioned, and with strong muscular impressions. The head showed the slight prolongation of the articular surface on to the upper part of the anterior surface of the neck, which I have elsewhere named the extensor area.† The upper end of the anterior intertrochanteric line was unusually strong, and indicated that the ilio-femoral ligament which takes so important a part in the maintenance of the erect attitude had been well developed. The gluteal ridge and the linea aspera were strongly marked. The flattening of the upper third of the shaft which I described in some aboriginal femora,‡ and which MANOUVRIER has subsequently termed platymery, was not present, and there was no external infra-trochanteric ridge distinct from the gluteal ridge. The transverse diameter of the upper third of the shaft was 23 mm., the antero-posterior 18 mm., and the index of platymery was 78. The transverse diameter of the shaft opposite the nutrient foramen was 20 mm., the antero-posterior diameter was 23 mm., and the pilastric index was 115, which expresses the relatively strong projection of the linea aspera. The articular surface of the internal condyl was not specially prolonged upwards and backwards.

The Tibia was well-proportioned. The head was somewhat retroverted ; the internal condylar surface was concave, the external was plano-concave. The shaft was not platyknic; its breadth in the middle was 18 mm., its antero-posterior diameter 22 mm., and the index was 81·8. At its lower end the tibia had a well-marked astragalar articular facet, prolonged to the front of the bone. Associated with this was a corresponding prolongation of the upper articular surface on the astragalus, which was almost continuous with the anterior convex surface for the scaphoid. So well defined was this additional tibio-astragalar articulation that, as ARTHUR THOMSON and HAVELOCK CHARLES have shown, the ankle joint must have been frequently acutely flexed as takes

\* For the use of this term see my *Challenger Report on Human Skeletons*, part xlvii., 1886.

† Address to section of Anthropology in *British Association Reports*, Toronto, 1897.

‡ *Challenger Report*, *op. cit.*, page 97.

place in the attitude of squatting.\* The Fibula was well marked in its surfaces, borders, and muscular impressions.

The long bones had the following dimensions :—

|   | Right.  |
|---|---------|
| Femur, maximum length, . . . . .                      | 368 mm. |
| „ oblique length, . . . . .                           | 365 „   |
| Tibia condylar surface to tip of malleolus, . . . . . | 299 „   |
| „ „ „ astragalar surface, . . . . .                   | 295 „   |
| Fibula, maximum length, . . . . .                     | 299 „   |

It will be observed that the tibia and fibula are of the same length. The tibio-femoral index, calculated from the oblique length of the femur and the condylo-astragalar length of the tibia, was 80·9, and the leg, therefore, scarcely reached dolichoknemic proportions; a result similar to that which I obtained from the measurement of four skeletons of Andaman Islanders, in which the mean index was 81·2. An index of the relative length of the upper and lower limbs, called intermembral index, has been obtained by the following formula  $\frac{\text{humerus} + \text{radius} \times 100}{\text{femur} + \text{tibia}}$ , in which the maximum length of the bones was taken. In the Sakai skeleton this index was 68·3, which is somewhat less than the mean 68·9 obtained some years ago by FLOWER and myself from the measurement of a number of skeletons of Andaman Islanders. In both these people this index is relatively low, and points to the bones of the shaft of the upper limb, being short in comparison with those of the lower limb. The relative lengths of the humerus and femur have been calculated by the formula  $\frac{\text{humerus} \times 100}{\text{femur}}$ , and the index is 68·7, a number which is less than the mean 70 obtained by FLOWER and myself in the Andaman Islanders.

With the view of obtaining an estimate of the stature of the person whose skeleton I had examined, I compared the length of the femur and tibia with that of the corresponding bones of a male Andaman islander in the University Museum,† whose articulated skeleton was 4 feet 6½ inches (1385 mm.) in height. The oblique length of the femur in this skeleton was 385 mm. (15 $\frac{1}{10}$  ins.), and the condylo-astragalar length of the tibia was 322 mm. (12 $\frac{6}{10}$  ins.)—together, 707 mm. (27 $\frac{7}{10}$  ins.): whilst in the Sakai skeleton the corresponding diameters in the two bones were together only 660 mm. (26 ins.), which points to a stature about two inches less than that of the Andaman islander.

A short time after the receipt of the skeleton of the Sakai, Dr DUNCAN SCOTT presented me with a skull found in the jungle in Ulu Pahang, on the eastern sea-board of the Malay peninsula, immediately to the north of Johore. The collector from whom Dr SCOTT received it could not say whether it was a Sakai or a Malay, but

\* *Journal of Anat. and Phys.*, 1889–1894.

† I am indebted to Colonel CADELL, V.C., for the gift of this skeleton, which I have had articulated.

thought from the locality that it was the former. Although there is a doubt as to the race, I have thought well to give a brief description of it.

The skull had been injured, and there was no lower jaw; it was obviously that of a man; the loss of teeth and the absorption of the sockets gave the impression of an aged person, but the cranial sutures were unossified and scarcely denticulated. In the right coronal, were two sutural bones, in the left pterion a small epipterice, and in the lambdoidal suture several small Wormian bones. In the *norma verticalis* the cranium was broadly ovoid, raised along the sagittal line, and sloping rapidly down to the parietal eminences, below which the sides were somewhat convex. Its length-breadth index was 79.4, a little below the brachycephalic numerical limit, and the vertical index was only 76.6,—so that in the proportions of length and breadth to height, it had the brachycephalic rather than the dolichocephalic character. The parietal was the longest of the longitudinal arcs. The actual length of this skull was 6 mm. more than the one just described, but its breadth was 13 mm. greater, which accounted for the higher length-breadth index. The parieto-occipital slope was gradual, and not more or less abrupt than one sees in the more characteristic brachycephalic crania; the occipital squama did not project much behind the inion.

The glabella and supra-orbital ridges were feeble; the frontal eminences were scarcely marked; the forehead receded a little; the nasion was not depressed; the nasal bones slightly projected, and the bridge was shallow; the anterior nares were wide, but the height of the nose, 51 mm., brought the index into the mesorhine group; the nasal spine of the superior maxillæ was feeble. The absorption of the incisive alveoli made it impossible to determine the original projection of the jaw, and the gnathic index, 94.9, is only approximative. The broken zygomata prevented the width of the face from being taken. The cranial capacity was mesocephalic.

Although much remains to be done to complete our knowledge of the inhabitants of the Malay peninsula, it is obvious that in addition to the Malays, who dwell on the sea-coast, and the Siamese invaders in the northern provinces, whose appearance in the peninsula is probably of relatively recent date, the hill-districts are peopled by tribes who, in their external characters and cranial configuration, differ from each other. From the preceding narrative it will be seen, that whilst some tribes named Semangs and Panghans have the black skin and frizzly hair characteristic of the Negritos, in other tribes the skin is not so dark, and the hair, though black, is not frizzly or woolly, but is relatively straight and several inches long. Travellers do not always differentiate by descriptive names the straighter-haired from the frizzly-haired people, and by some the name Sakai is employed to designate both varieties of aborigines who dwell in the hilly and jungly districts. If the frizzly-haired, black-skinned Negrito people are the aboriginal inhabitants, those with straighter hair doubtless also represent an ancient race. The question, however, naturally arises, whether there may not have been in the course of centuries an intermixture and cohabitation of the Negrito race with the straight-haired Malays from the sea-board,

as well as with the straight-haired Siamese who have entered the peninsula from the north, so as to lead to a modification in the physical characteristics of the people and the production in certain districts of a mixed race.

As regards the cranial configuration, the skull of the frizzly-haired Panghan, described by Professor VIRCHOW, was brachycephalic; and the figure which he has reproduced obviously represents a type of skull resembling that of the Andaman Islanders. The skull form, therefore, confirms the view of the presence of a Negrito people in the Malay peninsula.

Of the two skulls which I have described, the one from the Kintah district, from its locality and the nature of the interment, must be regarded as of an aboriginal race and not a Malay. The skull was dolichocephalic, a proportion which belongs neither to the Negrito nor to the Malay. From Dr SCOTT's description of the people, to whom he gives the general name of "Sakai," it would seem that the hill-tribes in this district had long and not frizzly hair, a skin not black but lighter in colour than the Malay, which, conjoined with the dolichocephalic skull, gave race characters differing materially from the Negritos. These people, however, have, like the Negritos, a low stature. The skull from Pahang, on the other hand, differed so materially in its proportions and general appearance from the Kintah specimen, that it cannot, I think, have belonged to the same tribe or race,—the proportion of the length-breadth index, though numerically mesaticephalic, 79·4, was essentially brachycephalic, though the parieto-occipital slope was not abruptly steep. In the form of the vertex and the proportions of the nose it differed from the Kintah skull, but its injured condition did not admit of a complete comparison being made. I hesitate, therefore, to give an opinion on the race to which it had belonged.

From the consideration of the whole question there seems to be little doubt that in the hill regions of the Malay peninsula two aboriginal races are met with, distinguished from each other by the colour of the skin, the characters of the hair, and the form of the cranium, though both possess in common a low stature.

## EXPLANATION OF PLATES IV.-VII.

The Plates and Figures are numbered in sequence with those in Part I. of this Memoir.

For the Photographs from which the figures are reproduced I am indebted to Mr W. E. Carnegie Dickson, B.Sc.

- FIG. 15. Gond, Godavery District, Central India, profile. Table I.  
 „ 16. The Same, full face. Table I.  
 „ 17. The Same, vertex. Table I.  
 „ 18. Kandh, Khoorda, Orissa, profile. Table I.  
 „ 19. The Same, full face. Table I.  
 „ 20. Bhúmij Tribe, Mánbhúm, ♂ æt. 30, profile, Table IV.  
 „ 21. The Same, full face. Table IV.  
 „ 22. The Same, vertex. Table IV.  
 „ 23. Tamil-speaking native of Madras, profile. Table II.  
 „ 24. The Same, full face. Table II.  
 „ 25. Uriyá, Baghmari Village, Orissa, profile. Table VI.  
 „ 26. The Same, full face. Table VI.  
 „ 27. Veddah, metopic skull, male, ♂ profile. Table IX.  
 „ 28. Veddah, Batticaloa, E. Coast of Ceylon, ♂ full face. Table IX.  
 „ 29. Múnda, Ranchi ♀, æt. 24, profile. Table III.  
 „ 30. Andaman Islander, ♂ profile. Table X.  
 „ 31. The Same, full face. Table X.  
 „ 32. The Same, vertex. Table X.  
 „ 33. Sakai, Malay peninsula, profile. Table X.  
 „ 34. The Same, full face. Table X.  
 „ 35. Section through skull of Juang, ♂, page 128. I.M., No. 443, Table V.  
 „ 36. Section through skull of Múnda, ♂, page 128. I.M., No. 26, Table III.



The Antero-posterior almost mesial sections show the contour of the crania and the radial measurements.

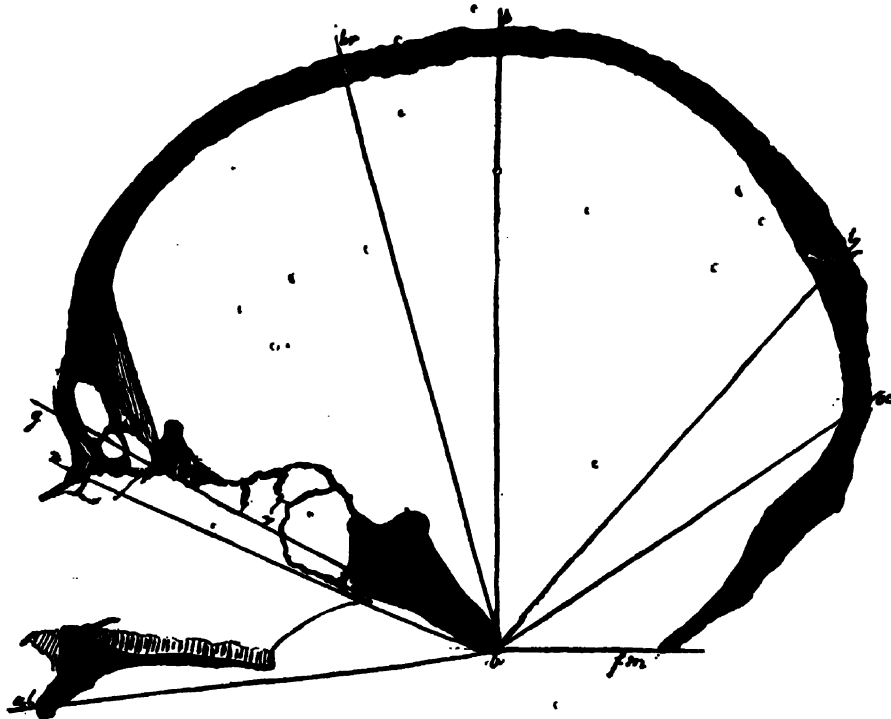


FIG. 35.—Juang.

*f.m.* plane of foramen magnum.

*b.* the basion: the lines drawn from which to the points on the circumference are radial from that point, and measure in millimètres as follows:—

|                                    | Juang. | Múnda. |  | Juang. | Múnda. |
|------------------------------------|--------|--------|--|--------|--------|
| <i>b.al.</i> basi-alveolar radius, | 103    | 95     | <i>b.p.</i> a radial line perpendicular to the | 145    | 133    |
| <i>b.n.</i> basi-nasal „           | 106    | 101    | plane of the foramen magnum,                   |        |        |
| <i>b.g.</i> basi-glabellar „       | 111    | 111    | <i>b.l.</i> basi-lambdal radius,               | 120    | 116    |
| <i>b.br.</i> basi-bregmatic „      | 142    | 128    | <i>b.oc.</i> basion to occipital point,        | 101    | 94     |

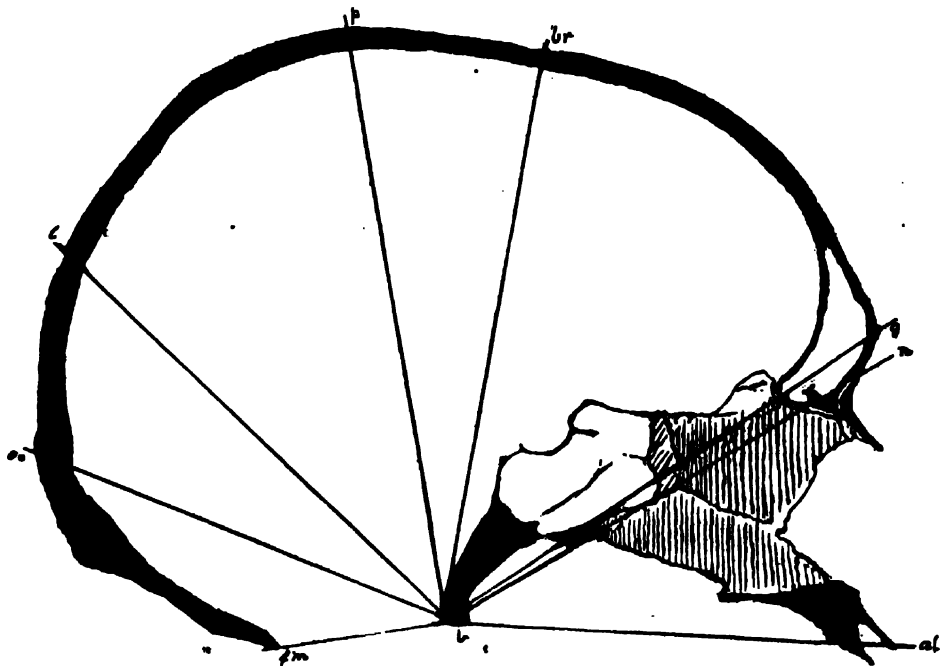


FIG. 36.—Múnda.

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SIR WILLIAM TURNER ON "Craniaology of People of India."—PLATE IV.



FIG. 15.—Gond.



FIG. 16.—Gond



FIG. 17.—Gond.



FIG. 18.—Kondh.



FIG. 19.—Kondh.

SIR WILLIAM TURNER ON "Craniology of People of India."—PLATE V.

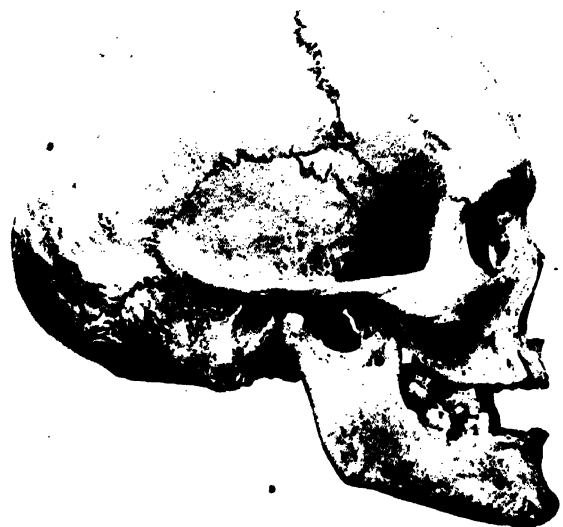


FIG. 20.—Bhūmij.



FIG. 21.—Bhūmij.

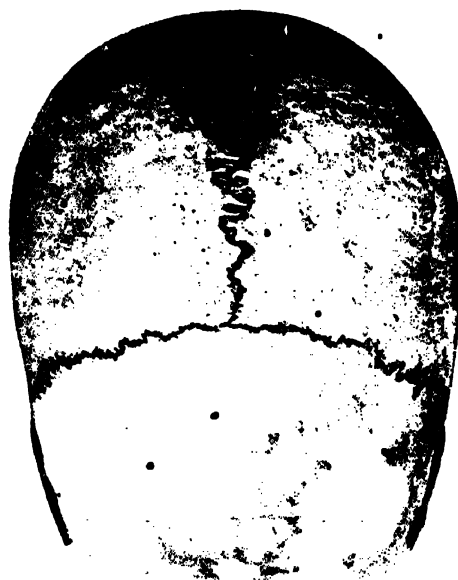


FIG. 22.—Bhūmij.



FIG. 23.—Tamil.



FIG. 24.—Tamil.

SIR WILLIAM TURNER on "Craniology of People of India."—PLATE VI.



FIG. 25.—Uriyá.

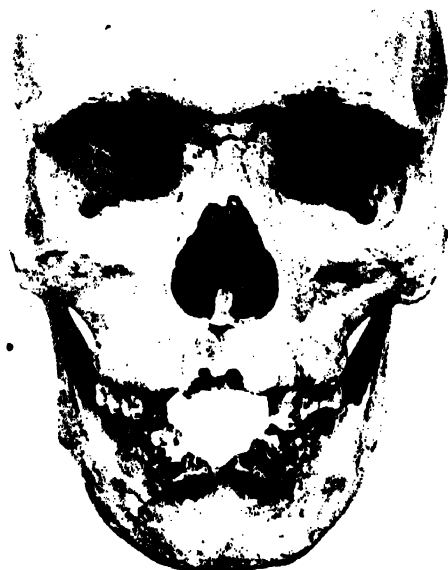


FIG. 26.—Uriyá



FIG. 29.—Múnda.



FIG. 27. —Veddah.



FIG. 28.—Veddah.



TRANSACTIONS

OF THE

ROYAL SOCIETY OF EDINBURGH.

VOL. XLV.—PART II.—(No. 10).

CONTRIBUTIONS TO THE CRANIOLOGY OF THE PEOPLE  
OF THE EMPIRE OF INDIA.

PART III.—NATIVES OF THE MADRAS PRESIDENCY, THUGS, VEDDAHS,  
TIBETANS, AND SEISTANIS.

BY

PRINCIPAL SIR WILLIAM TURNER, K.C.B., D.C.L., F.R.S.

[WITH FOUR PLATES.]

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**X.—Contributions to the Craniology of the People of the Empire of India.**  
**Part III.: Natives of the Madras Presidency, Thugs, Veddahs, Tibetans, and**  
**Seistanis. By Principal Sir Wm. Turner, K.C.B., D.C.L., F.R.S. (With Four**  
**Plates.)**

(Read June 4, 1906. Issued separately July 26, 1906.)

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**INTRODUCTION.**

Since the publication in the *Transactions* of this Society of Part II. of my Contributions to Indian Craniology,\* I have prepared for publication descriptions of additional series of skulls, both from India itself and from countries with which the Government of India has had diplomatic relations in recent years. From the Presidency of Madras I have obtained specimens of the Tamil-speaking Southern Dravidians, of Pariahs, and the skeleton of a Badaga. I have examined and described an interesting series of the skulls of the professional stranglers or Thugs. Some additional skulls of the Veddahs of Ceylon, with one of which the other bones of the skeleton had been preserved, have also been presented to the Anatomical Museum of the University. To former pupils attached as medical officers to the expeditions to Tibet and Seistan I am indebted for skulls from those countries. Thirty-nine specimens are described in this part, and their measurements are recorded in the tables.

**MADRAS PRESIDENCY.**

**TAMIL SUDRAS, TRICHINOPOLY. TABLE I.**

In July 1901 I received, through the courtesy of my friend Lieut.-Col. W. B. BANNERMAN, I.M.S., twelve skulls collected by direction of Lieut.-Col. W. A. LEE, I.M.S., in the native cemetery at Trichinopoly, near the banks of the river Cauvery, the burying-ground of the caste of the Tamil Sudra. They were of persons who

\* Part I. of these Contributions appeared in the *Transactions*, vol. xxxix. part 3, 1899; Part II. in vol. xl. part 1, 1901.

had reached adult life, and two were aged. Seven were without doubt males, and five had female characters. As they showed a want of uniformity in the relations of the length and breadth of the cranium, and in the proportions of the nasal region, they cannot well be considered in a common description.

In general form and proportion two male skulls (A and B) were brachycephalic, the cephalic index being 83.2 and 80.8 respectively, whilst a third (C), with the index 79.1, so closely approached A and B that it should be placed along with them.

*Norma verticalis*.—A was rounded in outline; the vertex was somewhat flattened, and the slope outwards to the parietal eminences, which were distinct, was gentle; the side walls bulged somewhat, and the interparietal diameter was the widest part of the cranium. The parieto-occipital region was flattened, especially on the right side, as if local pressure, applied in infancy, had caused an obliquity. B and C were not so rounded in outline, they were broadly ovoid; the sagittal line was somewhat raised and the slope to the parietal eminences was steeper than in A. The side walls bulged somewhat, the parieto-occipital slope was steep though not so flattened as in A. In all three skulls the parieto-squamous diameter much exceeded the interzygomatic, and the stephanic was more than the asterionic diameter. The crania were cryptozygous.

*Norma lateralis*.—In all the crania the forehead receded slightly, the glabella and supraorbital ridges were moderate, the nasion was depressed in C but not in A and B. In A the parietal longitudinal arc was the shortest and the frontal exceeded the occipital; in B and C the parietal was the longest and the occipital the shortest. A and B rested behind on the cerebellar fossæ of the occiput, C on the mastoids.

*Norma facialis*.—The floor of the nose was separated by a sharp border from the incisive region, and the maxillo-nasal spine was moderate. The nasal region was narrow, and the bridge of the nose was moderately projecting and concave. The maxillary part of the face was relatively long. The upper jaw did not project forwards. The orbital borders were thicker in C than in A and B, and in it also the canine fossæ were deep and the infraorbital suture was present: the orbital apertures were low. The palato-maxillary arch was wide and horseshoe-shaped.

The cranial sutures were simple and not obliterated. No skull was metopic. In A the occipital squama was almost equally divided into a mesial and two lateral parts, but the suture between the mesial and right lateral had nearly disappeared. The basion had a mesial 3rd condyl and the lateral condyls were flattened; a right paracondylar process, the free end of which was smooth, as if articular, was present. In B the parietal and sphenoid scarcely articulated in the pterion, but in the other skulls their suture was broad. The teeth were for the most part lost, but when present were stained with betel.

The mean dimensions in the three crania were as follows: glabello-occipital length, 174 mm.; basi-bregmatic height, 140 mm.; parieto-squamous breadth, 141 mm.; horizontal circumference, 507 mm.; vertical transverse circumference, 436 mm.; longitudinal circumference, 499 mm. The crania were of moderate dimensions in ex-

TABLE I.

*Trichinopoly—Tamil Sudras.*

Edinburgh University Anatomical Museum.

| Collection number,                           | A.    | B.    | C.    | D.    | E.    | F.    | G.    | H.    | I.    | K.    | L.    | M.    |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Age, . . . . .                               | Ad.   | Ad.   | Ad.   | Aged. | Ad.   | Ad.   | Ad.   | Aged. | Ad.   | Ad.   | Ad.   | Ad.   |
| Sex, . . . . .                               | M.    | M.    | M.    | M.    | M.    | F.    | F.    | M.    | F.    | M.    | F.    | F.    |
| Cubic capacity, . . . . .                    | 1290  | 1300  | 1380  | 1270  | 1255  | 1295  | 980   | 1240  | 1145  | 1320  | 1210  | 1305  |
| Glabello-occipital length, . . . . .         | 173   | 172   | 177   | 175   | 170   | 176   | 166   | 179   | 171   | 175   | 177   | 179   |
| Basi-bregmatic height, . . . . .             | 136   | 138   | 147   | 134   | 134   | 135   | 129   | 135   | 127   | 141   | 133   | 132   |
| Vertical Index, . . . . .                    | 78.6  | 80.2  | 83.1  | 76.6  | 78.8  | 76.7  | 77.7  | 75.5  | 74.3  | 80.6  | 75.1  | 73.7  |
| Minimum frontal diameter, . . . . .          | 99    | 95    | 98    | 87    | 90    | 92    | 86    | 93    | 84    | 90    | 91    | 96    |
| Stephanic diameter, . . . . .                | 116   | 114   | 118   | 115   | 107   | 108   | 106   | 104   | 102   | 108   | 110   | 112   |
| Asterionic diameter, . . . . .               | 105   | 105   | 106   | 102   | 100   | 106   | 101   | 94    | 102   | 112   | 101   | 103   |
| Greatest parieto-squamous breadth, . . . . . | 144p. | 139s. | 140s. | 134s. | 128p. | 133s. | 128   | 130p. | 123s. | 130p. | 130p. | 132p. |
| Cephalic Index, . . . . .                    | 83.2  | 80.8  | 79.1  | 76.6  | 75.3  | 75.6  | 77.1  | 72.6  | 71.9  | 74.3  | 73.4  | 73.7  |
| Horizontal circumference, . . . . .          | 502   | 508   | 512   | 500   | 482   | 498   | 476   | 497   | 475   | 494   | 498   | 503   |
| Frontal longitudinal arc, . . . . .          | 127   | 130   | 128   | 135   | 123   | 129   | 116   | 136   | 126   | 130   | 124   | 126   |
| Parietal " " . . . . .                       | 111   | 131   | 137   | 120   | 127   | 129   | 116   | 122   | 128   | 125   | 126   | 128   |
| Occipital " " . . . . .                      | 123   | 107   | 99    | 108   | 102   | 107   | 105   | 108   | 104   | 123   | 119   | 114   |
| Total " " . . . . .                          | 361   | 368   | 364   | 363   | 352   | 365   | 337   | 366   | 358   | 378   | 369   | 368   |
| Vertical transverse arc, . . . . .           | 311   | 320   | 315   | 313   | 295   | 307   | 290   | 300   | 284   | 306   | 291   | 298   |
| Basal transverse diameter, . . . . .         | 120   | 119   | 124   | 119   | 115   | 115   | 112   | 115   | 106   | 120   | 111   | 110   |
| Vertical transverse circumference, . . . . . | 431   | 439   | 439   | 432   | 410   | 422   | 402   | 415   | 388   | 426   | 402   | 408   |
| Length of foramen magnum, . . . . .          | 30    | 37    | 36    | 35    | 35    | 34    | 30    | 33    | 34    | 36    | 33    | 30    |
| Basi-nasal length, . . . . .                 | 98    | 98    | 107   | 99    | 99    | 100   | 100   | 103   | 92    | 94    | 96    | 99    |
| Basi-alveolar length, . . . . .              | ...   | 91    | 100   | 96    | 93    | 96    | 98    | 97    | 89    | 90    | ...   | ...   |
| Gnathic Index, . . . . .                     | ...   | 92.9  | 93.5  | 97.   | 93.9  | 96.   | 98.   | 94.2  | 96.7  | 95.7  | ...   | ...   |
| Total longitudinal circumference, . . . . .  | 489   | 503   | 507   | 497   | 486   | 499   | 467   | 502   | 484   | 508   | 498   | 497   |
| Interzygomatic breadth, . . . . .            | 126   | 126   | 130   | 131   | 126   | 121   | 116   | 128   | 115   | 121   | 117   | 115   |
| Internalar " " . . . . .                     | 123   | 114   | 116   | 114   | 109   | 110   | 106   | 116   | 105   | 111   | 106   | 105   |
| Nasio-alveolar length, . . . . .             | 66ap. | 68    | 68    | 71    | 57    | 64    | 62    | 61    | 56    | 59    | ...   | ...   |
| Maxillo-facial Index, . . . . .              | 52.3  | 54.   | 52.3  | 54.2  | 45.2  | 52.8  | 53.4  | 47.6  | 48.7  | 48.7  | ...   | ...   |
| Nasal height, . . . . .                      | 52    | 51    | 49    | 55    | 44    | 48    | 43    | 48    | 41    | 46    | 48    | 46    |
| Nasal width, . . . . .                       | 23    | 23    | 24    | 25    | 23    | 21    | 24    | 26    | 20    | 24    | 25    | 25    |
| Nasal Index, . . . . .                       | 44.2  | 45.1  | 49.   | 45.5  | 52.3  | 43.8  | 55.8  | 54.2  | 48.8  | 52.2  | 52.1  | 54.3  |
| Orbital width, . . . . .                     | 41    | 39    | 41    | 42    | 38    | 38    | 34    | 41    | 37    | 39    | 38    | 36    |
| Orbital height, . . . . .                    | 32    | 31    | 34    | 31    | 29    | 35    | 33    | 32    | 30    | 28    | 31    | 30    |
| Orbital Index, . . . . .                     | 78.   | 79.5  | 82.9  | 73.8  | 76.3  | 86.8  | 97.1  | 78.   | 81.1  | 71.8  | 81.6  | 83.3  |
| Palato-maxillary length, . . . . .           | ...   | 53    | 55    | 54    | 52    | 53    | 55    | 51    | 51    | 50    | ...   | ...   |
| Palato-maxillary breadth, . . . . .          | 70    | 61    | 66    | ...   | 55    | ...   | 60    | 65    | 58    | 63    | ...   | ...   |
| Palato-maxillary Index, . . . . .            | ...   | 134.  | 120.  | ...   | 105.5 | ...   | 109.  | 127.  | 113.7 | 126.  | ...   | ...   |
| Nasio-Malar Index,* . . . . .                | 111.8 | 112.9 | 113.1 | 110.2 | 112.6 | 110.6 | 110.3 | 113.4 | 109.  | 107.4 | 109.6 | 110.8 |

\* The importance of measurements to determine the character of the profile of the nose was shown by Mr OLDFIELD THOMAS (*Journ. Anthropol. Inst.*, vol. xiv. p. 332, 1885). From them a nasio-malar index may be computed as follows, the bi-malar line being = to 100;  $\frac{\text{nasio-malar line} \times 100}{\text{bi-malar line}}$ . The bi-malar line is the distance in a direct line between the most posterior points of

the malar borders of the two orbits. The nasio-malar line I measured with sliding compasses between these points on the two malar bones and the mid-point of the nasion. A low, flat-faced profile is *platyopic*, say, with index below 106; a projecting profile is *pro-opic*, say, with index above 110; whilst one with intermediate projection is *mesopic*.

ternal measurements. In A and B the vertical index was less than the cephalic, but in C the height was more than the breadth. The mean vertical index was 80.6, hypsicephalic, and the mean length-breadth index was 81, brachycephalic. As the breadth-height index in A and B was less than 100, the index was platychamæcephalic.\*

In each skull the jaw was orthognathous, the maxillo-facial index was leptoprosopic, the orbits were microseme, the palate was hyperbrachyuranic; the nasal index in two was leptorhine, in the third mesorhine. The nasio-malar index ranged from 111.8 to 113.1, and the mean was 112.6.

The intracranial capacity ranged from 1290 to 1380 c.c., and the mean of the series was 1323 c.c.

The other skulls (D to M), measured in Table I., had, as regards five, the cephalic index below 75, and were dolichocephalic; the remaining four ranged in the index from 75.3 to 77.1; they were in the lower term of the mesaticephalic group and were approximately dolichocephalic. They had reached adult life, and two were aged. Four were males and five were apparently females.

*Norma verticalis*.—The crania were elongated and relatively narrow. In the females the parietal eminences were projecting. D and H were somewhat flattened at the vertex. In four crania the sagittal line was slightly raised and the slope downwards to the parietal eminences was well marked. The crania had a gradual slope downwards in the parieto-occipital region, which in some specimens was flattened from side to side: the occipital squama bulged a little backwards. The side walls as a rule were not bulging. In several crania the greatest parieto-squamous breadth only slightly exceeded the interzygomatic diameter. The stephanic was more than the asterionic diameter, except in one specimen where they were equal. The skulls were cryptozygous.

*Norma lateralis*.—In the males the forehead sloped gently backwards, the glabella and supraorbital ridges were moderate, and the nasion was a little depressed. In the females the forehead was nearly vertical, the supraorbital ridges were feeble, and the nasion was scarcely depressed. The bridge of the nose was usually short, it projected somewhat forwards and downwards, was as a rule concave, but in G, I, and L it had a tendency to flattening. In all the crania the occipital longitudinal arc was the shortest: in four the parietal arc was longer than the frontal, in two they were equal. Three crania rested behind on the mastoids, five on the cerebellar fossæ, one on the occipital condyls (Pl. VIII., figs. 37–39).

*Norma facialis*.—The floor of the nose was separated from the incisive region of the maxilla by a ridge which in some was sharp but in others was low and smooth. The maxillo-nasal spines were moderate. The upper jaw did not project forwards. In

\* In my memoir on the Craniology of the People of Scotland (*Trans. Roy. Soc. Edin.* vol. xl. part iii. p. 599, 1903), I have specially referred to the relations of the breadth to the height of the cranium, and have computed a breadth-height index from the following formula:  $\frac{\text{basio-bregmatic height} \times 100}{\text{parieto-squamous breadth}}$ . When the index exceeds 100 the skull is *hypsistenocephalic*, a high, narrow skull; when less than 100, *platychamæcephalic*, a wide, low skull.

three the anterior nares were wide, in two they were narrower and more elongated, in four they were intermediate in character. The maxillary region of the face was moderately long. In several specimens the orbital borders were thickened, and in two the infra-orbital sutures were present. In E the canine fossæ were deep. The orbital apertures were usually low, but in one specimen the opening was rounded. The palato-maxillary arch was variable.

The cranial sutures were simple, but in three they were almost entirely obliterated, although in one of these indications of the frontal suture were visible. In all the parieto-sphenoid articulation was well marked. In four crania one or two small Wormian bones were in the lambdoid suture. There was no 3rd condyl, but in two crania the jugal processes were tuberculated.

In the group of nine skulls, dolichocephalic or approximating thereto, the mean dimensions of four males were : glabello-occipital, 174.7 mm. ; basi-bregmatic, 136 mm. ; greatest breadth, 130.5 mm. ; horizontal circumference, 493.2 mm. ; vertical transverse, 420.7 ; total longitudinal, 498.2 mm. Compared with the mean dimensions of the three brachycephalic males, the mean length and longitudinal circumference were almost alike in both groups, but the mean height, breadth, horizontal and vertical transverse circumference were distinctly greater in the brachycephali.

In the five female dolichocephali the mean corresponding dimensions were : length, 173.8 ; height, 131.2 ; breadth, 129.2 ; horizontal circumference, 490 ; vertical transverse circumference, 404.4 ; longitudinal circumference, 489.4 mm. In the mean length, breadth, and horizontal circumference the males did not much exceed the females, but in the male dolichocephalic group, the height, vertical transverse, and longitudinal circumference were materially greater than in the females.

The intracranial capacity of the males ranged from 1240 to 1320 c.c., and the mean was 1271 ; the range in the females was from 980 to 1305, with a mean 1187 c.c. It is seldom that a woman's skull is less than 1000 c.c., though three Australians which I have measured were 930, 946, and 998 c.c. respectively.\* Presumably in all such cases the stature had been low and the general physique feeble.

In this group of nine skulls the height in seven was more than the breadth, the vertical index was therefore greater than the cephalic, but in two skulls these indices were equal. The mean vertical index was 76.5, hypsicephalic ; the mean cephalic index was 74.5, dolichocephalic. The breadth-height index in these skulls was above 100, and they were hypsistenocephalic.

As regards the mean proportions of the face the upper jaw was orthognathic, 95.9 ; the maxillo-facial index was leptoprosopic in three, mesoprosopic in four, and the mean, 50, was mesoprosopic ; the nasal index was platyrrhine in three, mesorrhine in four, leptorrhine in two, and the mean, 51, was mesorrhine ; the nasio-malar index ranged from 107.4 to 113.4, and the mean was 110.5, so that the nasal bridge projected moderately and the

\* See my memoirs on Human Skulls and Skeletons in *Challenger Reports*, part xxix. p. 35, 1881, and part xlvii. p. 122, 1886.

face was mesopic; the orbits, microseme in seven, mesoseme in one, and megaseme in one, had a mean microseme or low index 81; the palato-maxillary arch ranged from elongated dolichuranic to short and very wide hyperbrachyuranic proportions, and the mean, 116, was brachyuranic.

Owing to the difference in form between the skulls marked A, B, C and those of dolichocephalic form and proportions, I applied for further information regarding the cemetery and the persons buried in it. In reply Colonel LEE writes that sometimes wandering beggars or bhairagis, who may die at Trichinopoly, are buried there, which may account for the presence of a few specimens of a different type. Further, he says that the only inhabitants of the city are the Dravidians and the Muhammadans; many of the latter are "pucka" Musalmans, others are Lubbais,\* but they have separate burial-grounds.

As it is not possible to speak definitely of the race to which the three skulls possessing brachycephalic characters belonged, I can do little more than record their appearance and measurements. Obviously they were not Dravidians, and in all probability they were importations from outside sources, though it can scarcely be said that their facial characters associated them with the Mongoloid type.

As in Part II. of these Memoirs I have described a number of skulls of undoubted Dravidian tribes from the Central Provinces, and analysed their characters, a comparison may now appropriately be made between them and the Tamil skulls from Southern India. In both series the crania were elongated and dolichocephalic, an occasional skull having an index in the lower term of the mesaticephalic group; in both the nasal index was platyrrhine or mesorrhine, a leptorrhine index being exceptional; in both the upper jaw was orthognathic, in the Tamils no skull was prognathous, and in the previous Dravidian series only one in thirty-six skulls had so high an index; in both the prevailing orbital index was low or microseme; in the previous series the mean maxillo-facial index was low or chamaeprosopic, in the Tamils the mean index was somewhat higher and mesoprosopic; the palato-maxillary arch, though with a wide variation in each series, was in the mean brachyuranic; in both the cranial capacity was below the European average. The cranial configuration in both series therefore closely corresponded, and testified to their racial affinities.

#### PARIAHS. TABLE II.

Europeans have long recognised in Southern India people known as Pariah, Pareiyas, or Paraiyan, forming a low caste engaged in agriculture, domestic service, and various menial occupations. In the recent Census of India (1901) their number is given as 2,258,611,† of whom upwards of two millions are in Madras, and the remainder live in

\* The Lubbais, variously spelt Labbeis, Lubbye, Lubbays, are people speaking Tamil, but Musalmans in religion, who are believed to be the descendants of Arabs who have intermarried with Dravidian native women.

† *Census of India*, vol. I. - A, by H. H. RISLEY and E. A. GAIT; part ii., Tables, pp. 303, 341. Calcutta, 1903.

Coorg, Burma, Cochin, and Travancore. Their language is Tamil, and they are Hindus in religion. Two classes have been distinguished amongst them,\* (a) a primitive Dravidian people, who were perhaps the original inhabitants of the country, and in course of time lost their independence and became servile; Bishop CAIDWELL states that they are† a well-defined, ancient caste which has its own subdivisions, usages, and traditions, and is jealous of the encroachments of the castes which are above and below it; (b) people who, or whose ancestors, had belonged to other and higher castes and had become degraded into a servile caste.

The collection formed by the Phrenological Society of Edinburgh, now part of the Henderson Trust, contains three skulls marked Pariah, Nos. 103-5. They were presented in 1828 by Sir G. S. MACKENZIE of Coul, and were procured at Madras by his son through the aid of a native, who took them from the burying-place of the caste.‡ They were all males, and had reached adult life. Some years ago the Rev. J. M. STRACHAN, M.D., of Madras, presented me with the skull of a Pariah which is now in the Anatomical Museum of the University. As the basi-cranial synchondrosis has barely completed its ossification, and the wisdom teeth are not erupted, the age was probably from 20 to 23. The lower jaw was absent in all the specimens, and the face was broken away in No. 104. The characters of the crania are summarised in the following description.

*Norma verticalis*.—The cranial outline was an elongated ovoid; the sagittal line was not ridged; the parietal eminences were well marked for male skulls; the slope downwards to them was steep in Nos. 103 and 104 but not in the others. In only one was the squamous region wider than the parietal. The parieto-occipital slope was gradual, there was no sign of artificial flattening, and the occipital squama bulged behind the inion. The crania were cryptozygous (Pl. VIII., figs. 40-42).

*Norma lateralis*.—The forehead was not retreating, the glabella and supraorbital ridges were moderate, though in Nos. 103 and 105 somewhat more projecting than in the others, and in them the nasion was depressed. The bridge of the nose was short, concave, and not flattened or rounded from side to side. In all the occipital longitudinal arc was the shortest, and in three the frontal longitudinal arc was longer than the parietal. Two skulls rested behind on the mastoids, and two on the cerebellar fossæ.

*Norma facialis*.—The nose was widely platyrrhine, 61·9, in No. 103, but mesorrhine in the other two. The floor of the nose was separated from the incisive region by a sharp ridge and the maxillo-nasal spine was moderate. The upper jaw was orthognathous in Nos. 103 and 48A, mesognathous in No. 105. The maxillo-facial index was leptoprosopic in No. 105, and mesoprosopic in Nos. 103 and 48A, the former of which had the platyrrhine nose. In the aged skull, No. 105, the canine fossæ were deep. The orbital borders in No. 105 were thick, and the index of the aperture was microseme. The

\* "Ueber die Indischen Parias," VON G. OPPERT, *Archiv für Anthropologie*, Bd. iv. Heft 2/3, p. 149, 1906.

† *Comparative Grammar of the Dravidian Languages*, p. 540, 2nd edition, London, 1875.

‡ *Phrenological Journal and Miscellany*, vol. v. p. 479, 1829.



TABLE II.\*

*Pariahs—Badaga.*

|   | Pariahs. |       |       |             | Badaga.     |
|---|----------|-------|-------|-------------|-------------|
|   | H.T.     | H.T.  | H.T.  | E. U. A. M. | E. U. A. M. |
| Collection number, . . . . .                          | 103      | 104   | 105   | 48a.        | Ad.         |
| Age, . . . . .  | Adel.    | Ad.   | Adel. | Adoles.     | M.          |
| Sex, . . . . .  | M.       | M.    | M.    | M.          | M.          |
| Cubic capacity, . . . . .                             | 1240     | 1162  | 1205  | 1223        | 1395        |
| Glabello-occipital length, . . . . .                  | 177      | 179   | 172   | 174         | 181         |
| Basi-bregmatic height, . . . . .                      | 130      | 135   | 128   | 131         | 131         |
| <i>Vertical Index</i> , . . . . .                     | 73.4     | 75.5  | 74.4  | 75.3        | 72.4        |
| Minimum frontal diameter, . . . . .                   | 88       | 91    | 96    | 93          | 96          |
| Stephanic diameter, . . . . .                         | 97       | 107   | 113   | 111         | 116         |
| Asterionic diameter, . . . . .                        | 101      | 96    | 92    | 99          | 106         |
| Greatest parieto-squamous breadth, . . . . .          | 126p.    | 123p. | 129p. | 128s.       | 140         |
| <i>Cephalic Index</i> , . . . . .                     | 71.2     | 68.7  | 75.   | 73.6        | 77.3        |
| Horizontal circumference, . . . . .                   | 498      | 488   | 488   | 484         | 520         |
| Frontal longitudinal arc, . . . . .                   | 124      | 130   | 135   | 127         | 137         |
| Parietal " " . . . . .                                | 132      | 124   | 112   | 122         | 128         |
| Occipital " " . . . . .                               | 103      | 107   | 108   | 107         | 111         |
| Total " " . . . . .                                   | 359      | 361   | 355   | 356         | 376         |
| Vertical transverse arc, . . . . .                    | 290      | 298   | 295   | 297         | 310         |
| Basal transverse diameter, . . . . .                  | 115      | 108   | 114   | 114         | 119         |
| Vertical transverse circumference, . . . . .          | 405      | 406   | 409   | 411         | 429         |
| Length of foramen magnum, . . . . .                   | 34       | 38    | 31    | 34          | 37          |
| Basi-nasal length, . . . . .                          | 103      | 100   | 98    | 99          | 98          |
| Basi-alveolar length, . . . . .                       | 99       | ...   | 97    | 96          | 97          |
| <i>Gnathic Index</i> , . . . . .                      | 96.1     | ...   | 99.   | 97.         | 99.         |
| Total longitudinal circumference, . . . . .           | 436      | 499   | 484   | 489         | 511         |
| Interzygomatic breadth, . . . . .                     | 126      | ...   | 123   | 120         | 127         |
| Intermalar " " . . . . .                              | 114      | ...   | 111   | 108         | 116         |
| Nasio-mental length, . . . . .                        | ...      | ...   | ...   | ...         | 112         |
| <i>Nasio-mental complete facial Index</i> , . . . . . | ...      | ...   | ...   | ...         | 88.1        |
| Nasio-alveolar length, . . . . .                      | 60       | ...   | 63    | 60          | 63          |
| <i>Maxillo-facial Index</i> , . . . . .               | 47.6     | ...   | 51.2  | 50.         | 49.6        |
| Nasal height, . . . . .                               | 42       | ...   | 45    | 47          | 47          |
| Nasal width, . . . . .                                | 25       | ...   | 23    | 24          | 24          |
| <i>Nasal Index</i> , . . . . .                        | 51.9     | ...   | 51.1  | 51.1        | 51.1        |
| Orbital width, . . . . .                              | 37       | ...   | 37    | 36          | 36          |
| Orbital height, . . . . .                             | 31       | ...   | 29    | 27          | 32          |
| <i>Orbital Index</i> , . . . . .                      | 83.8     | ...   | 78.4  | 75.         | 83.9        |
| Palato-maxillary length, . . . . .                    | 53       | ...   | 54    | 52          | 53          |
| Palato-maxillary breadth, . . . . .                   | 56       | ...   | 64    | 64          | 61          |
| <i>Palato-maxillary Index</i> , . . . . .             | 105.6    | ...   | 118.5 | 123.        | 115.        |
| <i>Nasio-malar Index</i> , . . . . .                  | 111.7    | ...   | 111.8 | 110.7       | 105.3       |
| Lower jaw. { Symphysial height, . . . . .             | ...      | ...   | ...   | ...         | 31          |
| { Coronoid " " . . . . .                              | ...      | ...   | ...   | ...         | 64          |
| { Condylod " " . . . . .                              | ...      | ...   | ...   | ...         | 65          |
| { Gonio-symphysial length, . . . . .                  | ...      | ...   | ...   | ...         | 88          |
| { Inter-gonial width, . . . . .                       | ...      | ...   | ...   | ...         | 102         |
| { Breadth of ascending ramus, . . . . .               | ...      | ...   | ...   | ...         | 30          |

\* In this, as in the other Tables in this series of memoirs, E.U.A.M. signify Edinburgh University Anatomical Museum; and H.T., Henderson Trust.

palate in No. 103 was dolichuranic, but much wider in the other skulls. In two specimens the hard palate was deeply arched, and in the adolescent skull the maxillo-premaxillary suture was distinct. The teeth were for the most part lost: those present were stained with betel.

In No. 103 the sagittal and lambdoid sutures were ossified, in No. 105 all the sutures were closed, in the remaining two they were open and relatively simple. Two skulls had Wormian bones in the lambdoid. The parieto-squamous suture was well marked: no skull had an epipteric bone. No. 103 had an indication of a 3rd condyl and the lateral condyls were flattened. In the adolescent skull each external pterygoid plate was continuous with a process from the spine of the sphenoid, and the conjoint plate was pierced by two pterygo-spinous foramina.

A feature in this series of skulls was the small range of variation in most of their important dimensions, which pointed to a uniformity in type. The mean horizontal circumference was 489.5 mm., the mean vertical transverse 407.7, and the mean total longitudinal 492 mm. The mean length of the cranium was 175.5 mm., the mean height 131, and the mean breadth 126.5 mm.; the mean breadth-height index was hypsistenocephalic. The height exceeded the breadth in all except in No. 105, in which it was only 1 mm. less, and the mean vertical index was 74.6, metriocephalic. In one the cephalic index was 75, in the others below that figure, and the mean was 72.1, therefore distinctly dolichocephalic.

The mean facial indices were as follows: gnathic index, 97.3, orthognathous; maxillo-facial, 49.6, mesoprosopic; nasal, 54.7, due to the high platyrrhine index of No. 103, but if that be excluded the mean nasal index, 51.1, was mesorrhine; orbital, 79, all microseme; palato-maxillary, 115.7, faintly brachyuranic. The nasio-malar index ranged from 110.7 to 111.8, and the mean was 111.4, and the projection of the bridge of the nose beyond the plane of the malar borders of the orbits gave the face a somewhat pro-opic profile. The intracranial capacity was low for male skulls, and ranged from 1162 c.c. to 1240 c.c.: the mean was 1207.5 c.c.

Bishop CALDWELL discussed the question whether the Pariahs were pre-Dravidian or belonged to the same race as the high-caste people of Southern India. Although several reasons of weight can be assigned in support of the theory of their pre-Dravidian origin, he inclined to the view that the lower castes in the Dravidian provinces are of the same race as the higher. He adduces in support of this position the essential unity of all the Dravidian dialects, and that there does not seem to be anything in the features of the Pariahs or in the colour of the skin which warrants the supposition that they are of a race different from their high-caste neighbours.

Mr EDGAR THURSTON published in 1896 and 1897 tables of comparative measurements of living natives of Madras,\* to which reference may be made for details, but

\* Madras Government Museum vol. i., *Bulletin* No. 4, p. 221, Madras, 1896; and vol. ii., *Bulletin* No. 1, Madras, 1897.

some mean measurements, which bear on the relation of the Pariahs to a higher caste, may usefully be reproduced :

|                             | Stature.           | Cephalic Index. | Nasal Index. |
|-----------------------------|--------------------|-----------------|--------------|
| 25 Tamil Bráhmans . . . . . | 162·5 cm. (64 in.) | 76·5            | 76·7         |
| 25 Tamil Pariahs, . . . . . | 161·9 „ (63½ „)    | 73·6            | 80·          |

In mean stature the Tamil Pariahs were almost the same as the Tamil Bráhmans. The cephalic index was lower, for whilst 18 Pariahs were dolichocephalic, 6 approximated thereto and one was a little below 80, none was brachycephalic; whereas 7 Tamil Bráhmans were dolichocephalic, 12 approximated thereto, and 6 were brachycephalic or in the higher half of the mesaticephalic group. The mean nasal index in the Tamil Pariahs was higher than in the Bráhmans, and indicated a nose more platyrrhine in its proportions.\* Recently M. L. LAPICQUE has published † additional figures bearing on the stature and proportions of the head and nose of the Pariahs, as follows :

|                     | Stature. | Cephalic Index. | Nasal Index. |
|---------------------|----------|-----------------|--------------|
| 23 Parias . . . . . | 163·7    | 76·1            | 78           |

These figures differ somewhat from those of Mr THURSTON. M. LAPICQUE discusses at some length the opinions expressed by Bishop CALDWELL, and arrives at a conclusion opposite to that of the distinguished Indian philologist.

When my measurements of the skulls of the Pariahs are compared with those of the dolichocephalic Tamil Sudras, it will be seen that though in both the mean index was dolichocephalic, the mean length was somewhat greater in the Pariahs; in both the mean height exceeded the breadth; the mean nasal index, No. 103 being excluded, was almost identical in the two series; the nasio-malar index in both showed a fair projection of the bridge of the nose, which was a little more pronounced in the Pariahs; in both the mean orbital index was low or microseme; the upper jaw in both was orthognathic, and the mean maxillo-facial index was mesoprosopic; in both the cranial capacity was low. The cranial and facial configuration of the Tamil Sudras and the Pariahs presented, therefore, important features of correspondence in their proportions, which are confirmatory of the opinion expressed by Bishop CALDWELL that there are strong racial affinities between both peoples.

#### BADAGA HILLMAN—NILGIRIS. TABLE II.

In July 1901 I received from Major D. SIMPSON, I.M.S., a package containing the skull and other bones of the skeleton of a Badaga Hillman of the Nilgiris, which Mr DASHE, Sanitary Inspector, had procured in response to a request made by Lieut.-Col. BANNERMAN, I.M.S. The man had died in the Coonoor Ghat, and, as the body had been buried, the bones were discoloured.

\* In his interesting memoir, "The Coorgs and Yeruvas: an Ethnological Contrast" (*Journal Asiatic Soc.*, Bengal, vol. lxx. part iii. No. 2, 1901), Mr T. H. HOLLAND has compiled comparative tables of measurements of the Pariahs with other tribes and castes in Southern India.

† *Bull. et Mém. de la Soc. Anthropol. de Paris*, v<sup>e</sup> série, t. vi. p. 400, 1905.

The skull was that of an adult male, and the teeth, with one exception, were complete, though the crowns were much worn and the dentine was exposed. In its external dimensions it was moderate in size, and the lower jaw was present.

*Norma verticalis*.—The cranium was broadly ovoid in outline, scarcely elevated in the sagittal region, the parietal eminences fairly prominent, and the slope downwards to them moderate, so that the cranium was "well filled." The side walls bulged slightly in the squamous region. The postero-parietal slope was gradual, the occipital squama bulged behind the inion, and there was no artificial flattening. The stephanic diameter much exceeded the asterionic. The parieto-squamous diameter was 13 mm. more than the interzygomatic, which again was 11 mm. more than the intermalar, and the skull was cryptozygous.

*Norma lateralis*.—The forehead sloped gently upwards, and the glabella and supraorbital ridges were moderate. The bridge of the nose was only 15 mm. long, concave upwards, somewhat rounded from side to side, and the nasion was depressed. The frontal longitudinal arc was the longest, and the occipital the shortest. The skull rested behind on the mastoid and on a process from the inion which projected downwards (Pl. IX., figs. 43 45).

*Norma facialis*.—The floor of the nose was not separated from the incisive region by a sharp ridge; the maxillo-nasal spine was feeble; the anterior nares were moderately wide and the nasal index was mesorhine, 51.1. The upper jaw projected somewhat forward and the index was 99, mesognathous. The face in both the complete and maxillo-facial indices was mesoprosopic. The canine fossæ were deeply hollowed. The orbital borders were not thickened, the apertures were low, and the index was mesoseme, 88.9. The palate was highly arched, the palato-maxillary region was moderately wide, and the index was brachyuranic, 115.

The cranial sutures were well denticulated and partially obliterated in the obelion. The pterion showed no irregular ossification, and there was no 3rd condyl or paracondylar process. The lower jaw was of moderate dimensions and the chin was well marked. The teeth were almost complete, flattened on the crowns with use, and stained with betel. The vertical index, 72.4, was metrioccephalic, and the cephalic index, 77.3, was mesaticcephalic; the parieto-squamous breadth was 9 mm. more than the basibregmatic height and the breadth-height index was platychamæcephalic. The intracranial capacity was 1395 c.c. The nasio-malar index, 105.3, was platyopic.

*Pelvis*.—The pelvis had male characters, and the muscular ridges were fairly well marked. The tubercle on the iliac crest was strong, the alæ were expanded and faintly translucent. The cotyloid cavity had a deep and wide notch in the margin. The pectineal ridges were moderate. The subpubic angle was 54°. The præ-auricular sulcus was scarcely recognisable. The back of the ilium, a part of the pubic body, the ischial tubera, and the back of the sacrum had been injured. The breadth-height index was moderate. The sides of the pelvic brim were smooth; the pelvic inlet was wide

and the brim index, 76·5, was markedly platypellic. The first coccygeal was fused with the last sacral vertebra. The sacrum had a moderately concave anterior surface; the base was 109 mm.; the length, not including the coccyx, was 93 mm.; the sacral index was 117, strongly platymeric. The measurements are recorded below.

*Measurements of Pelvis.*

|   | mm.     |
|---|---------|
| Breadth of pelvis, . . . . .                      | 254     |
| Height . . . . .                                  | 196     |
| <i>Breadth-Height Index</i> , . . . . .           | 77·1    |
| Between ant. sup. iliac spines, . . . . .         | 220     |
| „ outer borders ischial tubera, . . . . .         | 118     |
| Vertical diameter of obturator foramen, . . . . . | 47      |
| Transverse „ „ „ . . . . .                        | 32      |
| <i>Obturator Index</i> , . . . . .                | 68      |
| Subpubic angle, . . . . .                         | 54°     |
| Transverse diameter of pelvic brim, . . . . .     | 115     |
| Conjugate „ „ „ . . . . .                         | 88 app. |
| <i>Pelvic or Brim Index</i> , . . . . .           | 76·5    |
| Length of sacrum, . . . . .                       | 93      |
| Breadth „ „ „ . . . . .                           | 109     |
| <i>Sacral Index</i> , . . . . .                   | 117     |

*Spinal Column.*—The vertebræ were not complete in number, and several were injured. *Cervicals*, the 5th, 6th, and 7th were missing; the spines of the 2nd, 3rd, and 4th were short and bifid. *Dorsals*, the 3rd was missing; the 10th, 11th, and 12th had each only a single costal facet on the side of the body; the 10th had no costal facet on the transverse process; in the 11th and 12th the transverse and spinous processes were broken off; the inferior costal facet on the side of the body from the 4th to the 8th dorsal was elevated on a process, and in the 9th the process was present though not marked by a facet. In the *Lumbar* vertebræ the spines and transverse processes were broken off, except in the 5th, in which they had the normal characters of that bone. Mammary and accessory processes were also present in the lumbar. Measurements of the lower dorsals and the lumbaræ are recorded below:—

|                          | A. V. D. | P. V. D. | Index. |                  |
|--------------------------|----------|----------|--------|------------------|
| 9th Dorsal V., . . . . . | 21 mm.   | 20 mm.   | 95·2   | } Special Index. |
| 10th „ „ . . . . .       | 21 „     | 21 „     | 100·   |                  |
| 11th „ „ . . . . .       | 20 „     | 22 „     | 110·   |                  |
| 12th „ „ . . . . .       | 21 „     | 25 „     | 119·   |                  |
|                          | 83 mm.   | 88 mm.   | 106·   | General Index    |
| 1st Lumbar V., . . . . . | 23 mm.   | 26 mm.   | 113·   | } Special Index. |
| 2nd „ „ . . . . .        | 24 „     | 26 „     | 108·3  |                  |
| 3rd „ „ . . . . .        | 24 „     | 23 „     | 95·8   |                  |
| 4th „ „ . . . . .        | 24 „     | 22 „     | 91·6   |                  |
| 5th „ „ . . . . .        | 25 „     | 21 „     | 84·    |                  |
|                          | 120 mm.  | 118 mm.  | 99·1   | General Index.   |

The indices are obtained by the formula employed by Professor CUNNINGHAM and myself in our respective memoirs,\*  $\frac{\text{Post. Vert. Dr.} \times 100}{\text{Ant. Vert. Dr.}}$

The special index is the relation of the two diameters in each vertebra; the general index is their relation in the group of vertebræ. As regards the four lower dorsal vertebræ, the vertical diameter of the bodies posteriorly collectively exceeded by 5 mm. the anterior vertical diameter, which without doubt partially contributed to the production of the forward concavity in the dorsal region. In the lumbar spine, on the other hand, the collective anterior vertical diameters of the bodies exceeded by only 2 mm. the vertical diameter posteriorly. The 1st and 2nd lumbar, like the lower dorsals, together had the posterior diameter 5 mm. longer than the anterior; the reverse was the case in the 3rd, 4th, and 5th lumbar, in which the collective diameters were 7 mm. more in front than behind. In the 3rd lumbar the vertical diameter anteriorly was only 1 mm. more than the posterior, and it may be regarded as marking the transition between the upper and lower wedge-shaped groups. No information could be obtained of the thickness of the intervertebral discs, or the part which they took in the production of the lumbar convexity of the spine; but as the general lumbar index was 99.1, as compared with a mean index of 96 in the spine of Europeans, the convexity in this region would have been due to the intervertebral discs rather than to a marked wedge-shaped character of the vertebral bodies. The lumbar spine in this skeleton comes into the group which, when regarded from the vertical diameters of the bodies and not including the discs, I have elsewhere named orthorachic,† or straight-spine.

*Ribs.*—Several ribs were missing, and of those present some were injured. No peculiarities were noticed.

*Sternum.*—This bone was injured, but neither the manubrium nor ensiform was ossified with the body.

*The Upper Limb. Clavicles.*—These bones were slender and with feeble muscular ridges. The sigmoid curve was not pronounced, and the groove for the subclavius muscle was scarcely marked. The right was 117 mm. long, the left 119 mm.

*Scapula.*—Both bones were so much injured that neither the full length nor breadth could be measured. The coracoid notch was deep, and the axillary border of the bone was almost straight.

*Shaft of Upper Limb.*—The humerus, radius, and ulna were slender bones, and with moderate muscular markings. The humerus had no intercondylar foramen; as the musculo-spiral groove was feeble, there was scarcely any twist in the shaft of the bone. The ulnar articular surface for the head of the radius was large, and indicated freedom of movement in pronation and supination; the axis of the neck of the radius was prolonged into that of the shaft; whilst the shaft of the radius curved away from that of

\* CUNNINGHAM, *Nature*, February 18, 1886; and in CUNNINGHAM *Memoirs Royal Irish Academy*, 1886; TURNER, *Journal of Anatomy and Physiology*, April 1886; *Challenger Reports, Zoology*, part xlvii., 1886.

† Memoir in *Challenger Reports*, "On the Comparative Anatomy of the Human Skeleton," p. 72, part xlvii., 1886, *op. cit.*

the ulna, and the interosseous interval varied materially in transverse diameter, and at its widest was 20 mm. in the right forearm and 18 in the left.

|                                      | Right.  | Left.   |
|--------------------------------------|---------|---------|
| Humerus, extreme length, . . . . .   | 313 mm. | 310 mm. |
| Radius to tip of styloid, . . . . .  | 254 „   | 253 „   |
| „ base „ . . . . .                   | 247 „   | 247 „   |
| Ulna to tip „ . . . . .              | 273 „   | „       |
| „ lower articular surface, . . . . . | 270 „   | 270 „   |

The forearm was relatively long as compared with the upper arm, and the radio-humeral or ante-brachial index in the Badaga skeleton was 81, which places it in the group that I have elsewhere named *dolichokerkie*.

*Shaft of the Lower Limb. Femur.*—The bones were moderate in size. The extensor area of the head was distinctly prolonged on to the front and upper border of the neck. The anterior intertrochanteric line was moderately strong. The upper third of the shaft was somewhat flattened, and an external infratrochanteric ridge, distinct from the gluteal ridge and separated from it by a vertical groove, was present. The transverse diameter of the shaft a little below the small trochanter was 30 mm., and the antero-posterior was 22 mm.; the index of platymery was 73·3. The linea aspera was moderate; in the middle of the shaft the transverse diameter was R. 25, L. 24 mm., and the antero-posterior R. 24, L. 26 mm.; the pilastric index was R. 96 and L. 108. The popliteal surface was flattened. The condylar articular surfaces were well marked, and the internal condyl was prolonged obliquely upwards a little higher than the upper border of the intercondylar fossa.

*Tibia.*—The head of the right bone was slightly retroverted, that of the left a little more so. The internal condylar articular surface was concave, the external was concavo-convex. The muscular markings on the shaft were moderate. The antero-posterior diameter at the nutrient foramen was in the right 30 mm., in the left 31; whilst the transverse diameter was R. 24, L. 22 mm., the index in the right bone was 80, and in the left 70·9; the left bone was compressed laterally in the shaft.

The lower end of the left tibia had an articular facet on the anterior border, but this was absent in the right bone. In both astragali the tibial articular surface was prolonged forward on the neck to 7 mm. from the upper edge of the scaphoid surface.

*Fibula.*—The muscular markings were distinct, though the bones were slender.

*Patella.*—Only the right bone was present, the diameters of which were 40 × 39 mm.

The bones of the shaft measured as follows:—

|  | Right.  | Left.   |
|--|---------|---------|
| Femur, maximum length, . . . . .                   | 442 mm. | 439 mm. |
| „ oblique „ . . . . .                              | 438 „   | 437 „   |
| Tibia, from condyls to tip of malleolus, . . . . . | 365 „   | 374 „   |
| „ „ astragalar surface, . . . . .                  | 355 „   | 365 „   |
| Fibula, maximum length, . . . . .                  | 347 „   | „       |

The proportion between the thigh and the leg was estimated by taking the oblique length of the femur and the condylo-astragalar length of the tibia as in the following formula  $\frac{\text{tibial length} \times 100}{\text{femoral length}}$ . Owing to the inequalities in the length of these bones in opposite limbs, the right tibia was to the femur as 81 to 100, and the left as 83·7, which figures are the tibio-femoral index. On the proportion shown by the longer of the two limbs it may be regarded as dolichoknemic. The relative lengths of the upper arm and thigh may be estimated from the maximum lengths of the humerus and femur in the formula  $\frac{\text{humerus} \times 100}{\text{femur}}$ . Computed by the method of M. BROCA, the femoro-humeral index in this skeleton is 70; the humerus was shorter therefore in relation to the femur than in Europeans.

M. BROCA has a formula for estimating the relative length of the upper and lower limbs, and obtaining an intermembral index from the maximum length of the bones:  $\frac{\text{humerus} + \text{radius} \times 100}{\text{femur} + \text{tibia}}$ . The index in this skeleton is 70, which points to a proportion between the shafts of the two limbs not unlike that found in Europeans.

The stature calculated from the length of the femur and tibia would probably have been about 5 feet 3½ inches.

The Badagas are one of the five native tribes which occupy the Nilgiri Hills. Unlike the Todas, Kotas, Kurumbas, and Irulas, they are not regarded as an aboriginal race, but are supposed to have migrated from Mysore about three hundred years ago.\* They are Hindus, are engaged in agriculture, and speak a language which closely resembles old Kanarese. They numbered in Madras and Coorg in 1901 (census) 34,229 people.

Mr EDGAR THURSTON has given a description of the physical characters based on the examination of forty living Badagas.† The mean stature was 164·1 c.m. (5 ft. 4½ in.); the mean length of the head, 189 mm; breadth, 136 mm; cephalic index, 71·7, with a maximum 77·5 and a minimum 66·1; the nasal index ranged from 88·4 to 62·7, with the mean 75·6. In colour they were lighter than the other hill tribes, especially the women; they were smooth-skinned, of slender build, with narrow chest and shoulders. Mr THURSTON does not appear to have had the opportunity of examining a Badaga skull. As I have only had a single specimen, my data are too few to formulate a general statement, but the cephalic index, 77·3, of the skull, was almost on a par with the maximum index, 77·5, of the living person obtained by Mr THURSTON, and considerably higher than the mean, 71·7, of the index computed from his measurements. Thus, whilst the mean index was distinctly dolichocephalic, individuals had the cephalic index in the lower half of the mesaticephali, and the skull which I have measured came into the latter group.

\* ROSS KING, *Journal of Anthropology*, No. 1, p. 18, July 1780. J. W. BREEKS, *Primitive Tribes and Monuments of the Nilagiris*, London, 1873.

† *Bulletin Madras Government Museum*, vol. ii., No. 1, p. 7, 1897.



The nasal index in the skull was 51·1, whilst in the living people the average of the measurements was 75·6, a difference readily accounted for when it is kept in mind that the height of the nose is practically alike in the skull and the face, but that in the latter the alæ of the nose produce a width much greater than the width of the anterior nares. It has already been stated that the nasal index computed from the skull was mesorhine, and though in living persons the limits of the groups into which this index is arbitrarily divided are not numerically the same as in the skull, the mean obtained by Mr THURSTON is so distinct from the high platyrrhine index of living negroes and Australians on the one hand, and the low leptorrhine index of Europeans on the other, that it may fairly be regarded as mesorhine, though the range in measurement shows that some faces were distinctly platyrrhine and others leptorrhine.

### THUGS. TABLE III.

In the early years of the nineteenth century the Government of India became aware of the existence of organised gangs of assassins, who frequented the great roads of communication, and, in the character of pilgrims, or men engaged in business, gained the confidence of other travellers, and committed wholesale murder and robbery. Their depredations were not confined to particular districts, but extended throughout India from north to south and east to west.\* The name of Thugs was usually given to these assassins. An inquiry into their history showed that murder by strangling had been practised for a long period of time by certain families, who regarded the system of Thuggee as of divine origin, a rite authorised by the goddess Kalee or Bhawanee, and the persons murdered were looked upon by the Thugs as victims offered at the shrine of the goddess.

Although the practice of strangulation was pursued by families in whom it had become hereditary, and had assumed a caste-like distinction, children were occasionally adopted from other castes and trained to the occupation. There is a tradition that the early Thugs were Muhammadans, but in course of time Hindus became associated with them in the practice. About 1830 reports of the frequent murders of travellers caused the Governor-General, Lord WILLIAM BENTINCK, to take action for the suppression of this crime, and owing to the indefatigable zeal of Sir WILLIAM SLEEMAN, political officer at Saugor, Central Provinces, some hundreds of Thugs were captured, many of whom were hanged, and others transported and imprisoned. In course of time the organisation was crushed, and assassination by strangling as a profession has, it is believed, come to an end.

When, under the guidance of GEORGE COMBE, the phrenological doctrines and

\* See memoir in *Asiatic Researches*, by R. C. SHERWOOD, in which they are called P'hansigars, or Stranglers, vol. iii. p. 259: Calcutta, 1820. In this memoir, as well as in a Report by Mr JOHN SHAKESPEAR, p. 282, the alternative names Thegs and Badheks are given to them. See also *Ramaseena*, by W. H. SLEEMAN: Calcutta, 1836; *Edinburgh Review*, vol. lxiv. p. 357, 1837; *Quarterly Review*, vol. xciv. p. 506, 1901.

methods of GALL and SPURZHEIM were keenly discussed and advocated in Edinburgh, a valuable collection of skulls from various parts of the globe was formed under the auspices of the Phrenological Society, and became the property of the Henderson Trustees. As the crania were collected for the purpose of studying the form of the head in association with the moral and intellectual character of the individual, much attention was paid to the acquisition of skulls of persons whose history and career were known.

In 1834 Mr HENRY HARPER SPRY, of the Bengal Medical Service, presented to the Phrenological Society seven skulls of Thugs, selected from a party of one hundred, who had been executed in 1832, at Saugor, Central Provinces.\* Four of these skulls are in the Henderson Collection (Nos. 121–124), the other three (Nos. 125–127) are represented by casts. Two of the seven Thugs were Brāhmans, five were Musalmans. The Brāhmans, Dirgpaul (No. 121), and Gunga Bishun (No. 122), were convicted of numerous murders, and Dirgpaul, from his daring and success, was known by the Thugs as the Subahdar. The Musalmans, Soopher Sing (No. 123), Hosein Alee Khan (No. 124), Keramut Khan (No. 125), Buksha (No. 126), and Golab Khan (No. 127), were also well-known stranglers, and along with Dirgpaul the Brāhman, belonged to families who had been Thugs for generations. Mr ROBERT COX, a phrenologist, who reported on these skulls, stated that, with two exceptions, the organs of the propensities and lower sentiments preponderated over those of the higher faculties, but that in Hosein and Gunga there was no preponderance of either group, but that in them character had been determined by external circumstances.

Another series of four skulls (Nos. 128 to 131) are catalogued in the Henderson Trust Collection as Thugs, but without any details. Another, acquired from the Spurzheim Collection (Sp. c. 15), is that of Dhokul, a leading Thug, who was executed at Saugor in 1833. In the University Museum is the skull of a Thug hanged for murder, obtained from Colonel A. FRASER, Madras, and presented by Dr D. M. GREIG. I have also had the opportunity of examining the skull of a Thug from Northern India in the museum of the New College.

The series of Thugs comprised 11 skulls and 3 casts; they were all adult males, and two were aged. With the exception of two, the lower jaws were absent. In four specimens the cephalic index ranged from 75·4 to 77·8, two were below 70, and eight between 70 and 75. The general aspect of the series did not present any great range of variation, and they admit of being described as one group belonging to the dolichocephalic and lower term of mesaticephalic crania.

*Norma verticalis.*—In general form they were elongated and ovoid, though in one specimen the cephalic index was 77·8, which showed a proportionally wider transverse diameter; in some there was a tendency to a ridge-like elevation in the sagittal line, and in these a steep slope downwards to the parietal eminences existed, which gave a roof-like character to the cranium, but in others the transverse arc at the vertex was

\* *The Phrenological Journal and Miscellany*, p. 511: Edinburgh, 1834.

more rounded. In the majority of the skulls the greatest width was in the squamous region. Seven crania were 180 mm. or upwards in length, and the shortest skull was 171 mm. There was no evidence of artificial flattening in the occipital region, the degree of the slope downwards from the obelion varied, but in three specimens (Nos. 121, 130, and F and G) it was abrupt, and in all the occipital squama projected behind the inion. No skull was asymmetrical. In two skulls the temporal curved lines were strong, which pointed to powerful temporal muscles. The crania were cryptozygous.

*Norma lateralis*.—As a rule the forehead scarcely receded, though in Nos. 121 and 130 (fig. 62) the backward slope was more pronounced; the glabella and supraorbital ridges were moderate, though stronger in a few specimens; the nasion usually was not much depressed. In all the skulls the occipital longitudinal arc was the shortest, in eight the parietal exceeded the frontal, in three the frontal was the longest. Some skulls rested behind on the mastoids, others on the cerebellar part of the occiput (Pl. X., fig. 54).

*Norma facialis*.—The floor of the nose was usually separated from the incisive region by a sharp ridge, though in a few, No. 129 especially, the ridge did not exist, and the nasal floor and the incisive fossæ were directly continuous: the maxillo-nasal spine was moderate. The bridge of the nose varied in length from 18 to 23 mm.; it differed also in the sharpness of the ridge, in its degree of projection, and in the depth of its upward concavity; but in no specimen was it flattened or specially wide, and the greatest interorbital diameter was 20 mm. The nasal height ranged in the skulls from 46 to 52 mm.; the nasio-alveolar length from 58 to 64 mm.; the width of the anterior nares ranged from 21 to 27 mm. The nasio-malar index ranged from 106.3 to 117.7, and the mean was 109.3. The upper jaw, though varying in the degree of projection, was prognathous in only one skull, No. 124, and orthognathous in four specimens. The orbital borders showed no special thickening, and the aperture had a wide range in the relation of width to height. The palato-maxillary arch was in several wide and shallow, though in a few the arch was higher; and in Nos. 121, 129 its vault opposite the 2nd molar was 16 mm. in height. In No. 130 the upper jaw was only 11 mm. in vertical diameter in the incisive region, and in No. 131 only 13 mm.

The sutures showed various degrees of complexity, and whilst open in some specimens, they were in others in process of ossification, and in two were almost obliterated. Small Wormian bones were in the lambdoid in six specimens; in another the occipital squama had as special ossifications a large mesial and a smaller right lateral supraoccipital; in another specimen a small triquetral occupied the posterior end of the sagittal suture. The parieto-squamous suture was, with two exceptions, well marked; in two skulls were epipteric bones, and in one of these, No. 123, the left squamous-temporal articulated directly with the frontal bone. In several the spine of the temporal was fused with the bone; in three the jugal processes were tuberculated; no skull had a 3rd condyl; in No. 123 each external pterygoid formed a continuous plate with the spine of the sphenoid, and the plate was pierced by a foramen. In No. 15 a broad-based exostosis projected into the auditory meatus from the anterior wall.

TABLE III.

*Thugs.*

| Henderson Trust.                    |                          |               |            |       |       |       |       |       |       |       |       |      |      |      | Casts. |     |
|-------------------------------------|--------------------------|---------------|------------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|--------|-----|
| Skulls.                             |                          |               |            |       |       |       |       |       |       |       |       |      |      |      |        |     |
|                                     | E.A.U.M.<br>F. & G.      | N.C.<br>No. 7 | S.P.C. 15. |       |       |       |       |       |       |       |       |      |      |      |        |     |
| Collection number.                  | Ad.                      | Ad.           | Ad.        | Ad.   | Ad.   | Ad.   | Ad.   | Ad.   | Ad.   | Ad.   | Ad.   | Ad.  | Ad.  | Ad.  | Ad.    | Ad. |
| Age.                                | M.                       | M.            | M.         | M.    | M.    | M.    | M.    | M.    | M.    | M.    | M.    | M.   | M.   | M.   | M.     | M.  |
| Sex.                                | ...                      | 1235          | 1305       | 1285  | 1310  | 1218  | 1210  | 1360  | 1328  | 1275  | 1348  | ...  | ...  | ...  | ...    | ... |
| Cubic capacity.                     | 184                      | 171           | 180        | 182   | 176   | 175   | 173   | 187   | 181   | 176   | 176   | 185  | 176  | 186  | ...    | ... |
| Glabello-occipital length.          | 133                      | 130           | 134        | 125   | 135   | 130   | 132   | 133   | 135   | 128   | 123   | ...  | ...  | ...  | ...    | ... |
| Basal-bregmatic height.             | 72.3                     | 76            | 74.4       | 68.7  | 76.7  | 74.3  | 76.3  | 71.1  | 74.6  | 72.7  | 69.9  | ...  | ...  | ...  | ...    | ... |
| Vertical Index.                     | 89                       | 86            | 95         | 97    | 94    | 93    | 88    | 93    | 90    | 94    | 89    | ...  | ...  | ...  | ...    | ... |
| Minimum frontal diameter.           | 108                      | 106           | 106        | 111   | 108   | 107   | 108   | 111   | 109   | 115   | 113   | ...  | ...  | ...  | ...    | ... |
| Stephanic diameter.                 | 104                      | 100           | 104        | 101   | 99    | 108   | 103   | 106   | 105   | 111   | 105   | ...  | ...  | ...  | ...    | ... |
| Asterionic diameter.                | ...                      | ...           | ...        | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...  | ...  | ...  | ...    | ... |
| Greatest parieto-squamous breadth.  | 129p.                    | 130s.         | 126p.      | 132s. | 137s. | 132s. | 128s. | 134p. | 131p. | 130s. | 134s. | 128  | 131  | 126  | ...    | ... |
| Cephalic Index.                     | 70.1                     | 76            | 70         | 72.5  | 77.8  | 75.4  | 74    | 71.7  | 72.4  | 73.9  | 76.1  | 69.2 | 74.4 | 67.7 | ...    | ... |
| Horizontal circumference.           | 502                      | 483           | 501        | 506   | 502   | 492   | 488   | 515   | 502   | 508   | 498   | ...  | ...  | ...  | ...    | ... |
| Frontal longitudinal arc.           | 125                      | 122           | 123        | 130   | 122   | 119   | 122   | 132   | 123   | 123   | 133   | ...  | ...  | ...  | ...    | ... |
| Parietal                            | 130                      | 127           | 126        | 118   | 128   | 124   | 129   | 129   | 134   | 132   | 128   | ...  | ...  | ...  | ...    | ... |
| Occipital                           | 111                      | 112           | 111        | 113   | 110   | 108   | 110   | 122   | 119   | 107   | 109   | ...  | ...  | ...  | ...    | ... |
| Total                               | 366                      | 361           | 360        | 361   | 360   | 351   | 360   | 383   | 376   | 362   | 370   | ...  | ...  | ...  | ...    | ... |
| Vertical transverse arc.            | 303                      | 293           | 298        | 288   | 306   | 300   | 297   | 302   | 300   | 293   | 309   | ...  | ...  | ...  | ...    | ... |
| Basal transverse diameter.          | 114                      | 114           | 110        | 122   | 121   | 122   | 121   | 113   | 114   | 113   | 115   | ...  | ...  | ...  | ...    | ... |
| Vertical transverse circumference.  | 417                      | 407           | 408        | 410   | 427   | 422   | 418   | 415   | 414   | 406   | 424   | ...  | ...  | ...  | ...    | ... |
| Length of foramen magnum.           | 29                       | 30            | 38         | 32    | 34    | 30    | 34    | 34    | 38    | 36    | ...   | ...  | ...  | ...  | ...    | ... |
| Basal-nasal length.                 | 109                      | 94            | 103        | 99    | 105   | 105   | 96    | 96    | 99    | 91    | 97    | ...  | ...  | ...  | ...    | ... |
| Basal-alveolar length.              | 111                      | 89            | 102        | 98    | 103   | 97    | 96ap. | 92    | 95    | 92    | 102   | ...  | ...  | ...  | ...    | ... |
| Gnathic Index.                      | 101.8                    | 94.7          | 99         | 99    | 98.1  | 92.4  | 100   | 95.8  | 96    | 101.1 | 105.2 | ...  | ...  | ...  | ...    | ... |
| Total longitudinal circumference.   | 504                      | 485           | 501        | 492   | 499   | 486   | 491   | 513   | 513   | 489   | ...   | ...  | ...  | ...  | ...    | ... |
| Interzygomatic breadth.             | 122                      | 123           | 127        | 134   | 132   | 131   | 129   | 125   | 123   | 126   | 123   | ...  | ...  | ...  | ...    | ... |
| Internalar                          | 106                      | 113           | 117        | 119   | 121   | 118   | 113   | 114   | 110   | 115   | 111   | ...  | ...  | ...  | ...    | ... |
| Nasio-mental length.                | 104                      | 106           | ...        | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...  | ...  | ...  | ...    | ... |
| Nasio-mental complete facial Index. | 85.2                     | 86.1          | ...        | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...  | ...  | ...  | ...    | ... |
| Nasio-alveolar length.              | 65                       | 64            | 60         | 66    | 70    | 58    | 63    | 74    | 64    | 67    | 62    | ...  | ...  | ...  | ...    | ... |
| Maxillo-facial Index.               | 53.2                     | 52            | 47.2       | 49.2  | 53    | 44.2  | 48.8  | 59.2  | 52    | 53.1  | 50.4  | ...  | ...  | ...  | ...    | ... |
| Nasal height.                       | 50                       | 46            | 46         | 48    | 52    | 48    | 50    | 52    | 50    | 50    | 49    | 53   | 54   | 51   | ...    | ... |
| Nasal width.                        | 25                       | 22            | 24         | 24    | 25    | 26    | 25    | 21    | 25    | 21    | 27    | 27   | 26   | 27   | ...    | ... |
| Nasal Index.                        | 50                       | 47.8          | 52.2       | 50    | 48.2  | 54.2  | 50    | 40    | 50    | 42    | 55.1  | 50.9 | 48.1 | 52.9 | ...    | ... |
| Orbital width.                      | 40                       | 35            | 38         | 38    | 37    | 38    | 36    | 39    | 37    | 37    | 36    | ...  | ...  | ...  | ...    | ... |
| Orbital height.                     | 31                       | 30            | 31         | 33    | 32    | 30    | 33    | 33    | 34    | 33    | 31    | ...  | ...  | ...  | ...    | ... |
| Orbital Index.                      | 77.5                     | 85.7          | 81.6       | 86.8  | 86.5  | 78.9  | 91.7  | 84.6  | 91.9  | 89.2  | 86.1  | ...  | ...  | ...  | ...    | ... |
| Palato-maxillary length.            | 61                       | 52            | 54         | ...   | 60    | 55    | 51    | 51    | 55    | 51    | 58    | ...  | ...  | ...  | ...    | ... |
| Palato-maxillary breadth.           | 64                       | 61            | 64         | 67    | 62    | 59    | 63    | 62    | 64    | 63    | 62    | ...  | ...  | ...  | ...    | ... |
| Palato-maxillary Index.             | 105                      | 117.3         | 118.5      | ...   | 103.3 | 107.2 | 116.9 | 121.5 | 116.3 | 123.5 | 107   | ...  | ...  | ...  | ...    | ... |
| Nasio-malar Index.                  | 117.7                    | 106.6         | 107.9      | 111.2 | 107.2 | 110.3 | 106.3 | 109.4 | 108.5 | 107.3 | 110.6 | ...  | ...  | ...  | ...    | ... |
| Lower jaw.                          | Symphysial height.       | 31            | 30         | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...  | ...  | ...  | ...    | ... |
|                                     | Coronoid                 | 56            | 62         | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...  | ...  | ...  | ...    | ... |
|                                     | Condylloid               | 65            | 57         | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...  | ...  | ...  | ...    | ... |
|                                     | Gonio-symphysial length. | 81            | 82         | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...  | ...  | ...  | ...    | ... |
|                                     | Inter-gonial width.      | 80            | 90         | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...  | ...  | ...  | ...    | ... |
| Breadth of ascending ramus.         | 31                       | 31            | ...        | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...   | ...  | ...  | ...  | ...    | ... |

An analysis of the measurements recorded in Table III. gives the following results. The maximum length of fourteen specimens ranged from 171 to 187 mm., and the mean was 179 mm. The greatest breadth ranged from 126 to 137 mm., and the mean was 130.6 mm. The mean cephalic index was 72.9. It is to be noted that in seven specimens the absolute length exceeded 180 mm., and in these the highest cephalic index was 72.5 and the lowest 67.7: the dolichocephalic proportion was therefore strongly marked. In the remaining seven the length varied from 171 to 176 mm., and the cephalic index ranged from 73.9 to 77.8 and the mean was 75.3, a fraction higher than the highest numerical term of the dolichocephali.

In eleven in which the height was taken it ranged from 123 to 135 mm., and the mean was 130.7 mm. The mean vertical index was 73.3, *i.e.* metriocephalic. It should be noted that in only four skulls did the height exceed the breadth, and in these the highest cephalic index was 74; but in three other skulls, with cephalic indices 71.7, 72.5, 73.9 respectively, and therefore dolichocephalic, the breadth exceeded the height. In some skulls therefore the breadth-height index was platychamæcephalic, in others hypsistenocephalic.

As regards the proportions of the face, the upper jaw varied in the degree of projection: four skulls were orthognathous, six mesognathous, one prognathous, and the mean of the series was 98.4, mesognathous or a moderate projection. In only two could the complete facial index be computed, and the proportion of length to breadth was mesoprosopic. The maxillo-facial index was computed in all the skulls: one was chamaeprosopic, three mesoprosopic, seven leptoprosopic, and the mean of the series, 51.1, was leptoprosopic, *i.e.* a relatively long and narrow face. The nasal index showed considerable variation: three were leptorhine, two platyrhine, nine mesorhine, and the mean, 49.8, was mesorhine. No skull was platyopic in the profile of the nose, which as a rule had a fair extent of projection. In three skulls the orbital aperture was rounded and with megaseme index, in three it was low and microseme, in the remainder mesoseme, and the mean of the series, 85.5, was mesoseme. In the palato-maxillary arch four were dolichuronic, four brachyuronic, and two hyperbrachyuronic, and the mean, 113.6, was mesuronic: the form of the arch generally was moderately wide.

The mean intracranial capacity of ten skulls was 1290 c.c.; they ranged from 1210 to 1360 c.c.; the highest was considerably below the mean capacity of male European crania.

This analysis of the series of fourteen specimens of Thugs shows that no cranium was brachycephalic, in only four the cephalic index was above 75, and the highest of these was 77.8. Ten were dolichocephalic, and of these two were hyperdolichocephalic, and the nasio-malar index was not platyopic. It is obvious therefore that the professional stranglers were not drawn from the brachycephalic Mongoloid tribes which occupy the districts along the Himalayan frontier. As a narrow leptorhine nose was found in only a small proportion of these skulls, and as the nasal index was for the most part either mesorhine or platyrhine, it would seem as if these people had Dravidian

affinities. This conclusion is supported by the length and marked dolichocephalic proportion of the cranium, which is more pronounced in the Dravidian tribes than in Indo-Aryans like the high-caste Brāhmins of Bengal.\*

It should, however, be pointed out that the relatively long and narrow (leptoprosopic) face possessed by the greater number of the skulls is an Indo-Aryan character, so that possibly these families of Thugs were the result of intermarriage between members of the two dominant Dravidian and Indo-Aryan races.† Their religion, Hindu or Muslim as the case might be, would have been determined by the traditions and usage of their families, and by the prevailing religion of the district in which they lived.

Much has been written of late years on the skulls of those who had committed serious crimes, and a criminal type of skull has been looked for. As the Thugs had reduced assassination and robbery to a system, and carried it on in a wholesale manner, so that when a party of travellers was attacked no one was allowed to escape, and the dead bodies were buried without leaving a trace, and as these practices had been hereditary in families throughout several generations, the conditions, it may be thought, were such as to favour the production of a type of head indicative of moral perversion. The skulls were therefore examined for stigmata or characters which could be associated with a low development, or with degenerative changes in the head.

The lower region of the forehead, as a rule, ascended almost vertically from the glabella and supraorbital ridges, which were not specially prominent, and the nasion was not depressed. The vertex was not flattened, the cranial vault was arched (figs. 54, 63), and the mean height was about equal to the mean breadth. In two specimens, however, the forehead was retreating, and the glabella and supraorbital ridges were prominent (fig. 62). Although in several skulls the cranial sutures were undergoing obliteration from age, there was no sign of premature synostosis; and the presence of sutural bones, and modifications in ossification in the pterion, were not more frequent than is often met with in a similar number of skulls not obtained from criminals. The crania were not deformed either from artificial pressure or from developmental irregularity, and there was no departure from the customary symmetry. The dentition was normal, and in only one upper jaw were the wisdom teeth not erupted. The hard palate was usually shallow and moderately wide, but in two specimens it was highly arched and its depth was 16 mm. opposite the second molars. The maxillo-premaxillary suture was faintly marked in a few of the palates. In one skull the atlas was ossified to the occipital bone, but no specimen had a third condyl. Although the intracranial

\* Mr RISLEY, in his *Anthropometric Data of the Tribes and Castes of Bengal*, vol. i. p. 21, c.s. Calcutta, 1891, gives a table of measurements of a hundred Brāhmins. In 32 the cephalic index was 80 and upwards, in 30 it was from 77.5 to 79.9, in 25 from 75 to 77.4, and in only 13 it was below 75. When an allowance is made for the difference between the index in the living head and in the skull, there still remains a decided preponderance in the Brāhmins of heads either brachycephalic or approximating thereto.

† The influence exercised by intermarriage on the physical characters of a race is discussed in Mr T. H. HOLLAND's interesting study in *Contact Metamorphosis*, which shows the nature and degree of physical modification of the Kulu Kanet caste, owing to true blood fusion with the Mongoloid Kanets of Lahoul in the Western Himalayas (*Journ. Anth. Inst.*, vol. xxxii. p. 96, 1902).

capacity was much less than in male Europeans, it was higher than that of the Tamil Sudras and the Pariahs. This group of Thug skulls possessed in common no series of characters which one could associate with such maldevelopments or degenerations as have, by some authors, been regarded as giving evidence of a criminal type.

#### VEDDÁHS. TABLE IV.

Since I described in Part II. of these Contributions to Indian Craniology nine Veddah crania, not previously recorded, the Anatomical Museum of the University has received three skulls, one of which was accompanied by a large part of the skeleton. They were adults, and apparently males. One, C in Table IV., was presented in 1902 by F. V. HARPER, Esq., of Vogan, in recognition of the services rendered to the Museum by the late Mr JAMES SIMPSON, Assistant Curator; another, D, with the skeleton, was presented in August 1905 by H. O. HOSEASON, Esq., of Denodera, Ceylon; and a third, E, in November of the same year by Dr LORENZ PRINS of Ceylon.

The skulls resembled each other in general form, size, and the proportions of the cranium. They were dolichocephalic.

*Norma verticalis.*—The crania were neither flattened nor ridged in the sagittal region; the parietal eminences in C were strong, and the cranium had a pentagonal outline; in the other two the outline was an elongated ovoid. The vault sloped distinctly downwards and outwards from the sagittal line to the parietal eminences. In one the side walls were vertical below the parietal eminences, in the others they were slightly bulging. The post-parietal region sloped downwards and backwards, the occipital squama bulged behind the inion, and D showed slight want of symmetry behind. In two skulls the parieto-squamous diameter was only 3 mm. more than the interzygomatic, in one it was 4 mm. less. Two crania were phænozygous, one was cryptozygous.

*Norma lateralis.*—The forehead was almost vertical. The glabella and supraorbital ridges were feeble. The nasion was depressed in two crania, but not in the third. The bridge of the nose in C was only 16 mm. long, rounded from side to side, concave upwards and forwards. The anterior nares were wide in relation to the height of the nose, and the nasal index was platyrrhine. In D and E the nasal bridge was 21 mm. long and not so rounded or so concave; the nasal height was relatively much greater than the width, and the nasal index was leptorrhine. In all three crania the occipital longitudinal arc was the shortest, and the parietal arc was considerably longer than the frontal. The crania in two specimens rested behind on the cerebellar fossæ; in one on the occipital condyles.

*Norma facialis.*—The orbital borders in C were thick, but sharp in the others. In C an infraorbital suture was visible, and the canine fossæ were deep. In D and E the floor of the nose was separated from the incisive region by a sharp ridge. In E the incisive region was only 5 mm. in vertical diameter, and the face was consequently

TABLE IV.

*Veddahs.*

|   | C.     | D.        | E.     |
|---|--------|-----------|--------|
| Collection number.                                    | Vogan. | Denodera. | Prins. |
| Age, . . . . .  | Ad.    | Ad.       | Ad.    |
| Sex, . . . . .  | M.     | M.        | M.     |
| Cubic capacity, . . . . .                             | 1350   | 1375      | 1225   |
| Glabello-occipital length, . . . . .                  | 178    | 172       | 170    |
| Basi-bregmatic height, . . . . .                      | 134    | 131       | 135    |
| <i>Vertical Index</i> , . . . . .                     | 75.3   | 76.2      | 79.4   |
| Minimum frontal diameter, . . . . .                   | 87     | 90        | 93     |
| Stephanic diameter, . . . . .                         | 101    | 109       | 105    |
| Asterionic diameter, . . . . .                        | 99     | 113       | 97     |
| Greatest parieto-squamous breadth, . . . . .          | 129p.  | 129s.     | 127s.  |
| <i>Cephalic Index</i> , . . . . .                     | 72.5   | 75.0      | 74.7   |
| Horizontal circumference, . . . . .                   | 499    | 495       | 485    |
| Frontal longitudinal arc, . . . . .                   | 132    | 126       | 125    |
| Parietal " " . . . . .                                | 138    | 131       | 138    |
| Occipital " " . . . . .                               | 105    | 100       | 96     |
| Total " " . . . . .                                   | 375    | 357       | 359    |
| Vertical transverse arc, . . . . .                    | 290    | 300       | 298    |
| Basal transverse diameter, . . . . .                  | 114    | 118       | 108    |
| Vertical transverse circumference, . . . . .          | 404    | 418       | 406    |
| Length of foramen magnum, . . . . .                   | 34     | 36        | 31     |
| Basi-nasal length, . . . . .                          | 95     | 97        | 99     |
| Basi-alveolar length, . . . . .                       | 91     | 92        | 91     |
| <i>Gnathic Index</i> , . . . . .                      | 98.9   | 94.8      | 91.9   |
| Total longitudinal circumference, . . . . .           | 504    | 490       | 489    |
| Interzygomatic breadth, . . . . .                     | 126    | 133       | 124    |
| Intermalar " " . . . . .                              | 112    | 119       | 112    |
| Nasio-mental length, . . . . .                        | 97     | 119       | ...    |
| <i>Nasio-mental complete facial Index</i> , . . . . . | 77     | 89.4      | ...    |
| Nasio-alveolar length, . . . . .                      | 54     | 67        | 55     |
| <i>Maxillo-facial Index</i> , . . . . .               | 42.8   | 50.3      | 44.3   |
| Nasal height, . . . . .                               | 43     | 50        | 50     |
| Nasal width, . . . . .                                | 24     | 22        | 24     |
| <i>Nasal Index</i> , . . . . .                        | 55.8   | 44        | 48     |
| Orbital width, . . . . .                              | 35     | 39        | 38     |
| Orbital height, . . . . .                             | 31     | 36        | 31     |
| <i>Orbital Index</i> , . . . . .                      | 88.6   | 92.3      | 81.6   |
| Palato-maxillary length, . . . . .                    | 51     | 52        | 48     |
| Palato-maxillary breadth, . . . . .                   | 60     | 60        | 56     |
| <i>Palato-maxillary Index</i> , . . . . .             | 117.6  | 115.4     | 116.6  |
| <i>Nasio-malar Index</i> , . . . . .                  | 108.3  | 109.2     | 110.3  |
| Lower jaw. { Symphysial height, . . . . .             | 28     | 31        | ...    |
| { Coronoid " " . . . . .                              | 56     | 61        | ...    |
| { Condylod " " . . . . .                              | 58     | 62        | ...    |
| { Gonio-symphysial length, . . . . .                  | 82     | 87        | ...    |
| { Inter-gonial width, . . . . .                       | 95     | 98        | ...    |
| { Breadth of ascending ramus, . . . . .               | 32     | 34        | ...    |



chamæprosopic. In the platyrrhine skull, C, the floor of the nose was continued by a smooth surface into the incisive region, and the maxillo-nasal spine was feeble, the upper jaw was mesognathic, the face was low both in the complete and maxillo-facial regions, and the orbital apertures were also low. In D and E the jaw was orthognathic. In D the face was relatively long and the orbit was rounded; in E the orbits were low. In all three the palato-maxillary region was moderately wide.

The cranial sutures were not obliterated, and as a rule were simple. D and E had small Wormian bones in the lambdoid, and D had a large right epipterion. No 3rd condyl or paracondylar process was present, but E had a pair of small pointed processes projecting downwards immediately in front of the basion. The teeth were stained with betel and partially worn. The lower jaws were moderate in dimensions and with good chins.

The mean external dimensions were as follows: length, 173.3 mm.; height, 133.3; breadth, 128.3; horizontal circumference, 493; vertical transverse circumference, 409.3; total longitudinal circumference, 494.3 mm. In each skull the height was more than the breadth; the mean vertical index was 76.9, hypsicephalic; the mean cephalic index was 74, dolichocephalic; the breadth-height index was hypsistenocephalic. The mean facial indices were as follows: gnathic, 95.2, orthognathic; complete facial in two skulls with lower jaws, 83.2, chamæprosopic; maxillo-facial in three skulls, 45.8, mesoprosopic; nasal, 49.2, mesorhine; orbital, 87.5, mesoseme; palato-maxillary, 116.3, brachyuranic. The mean nasio-malar index was 109.2. The intracranial capacity ranged from 1225 c.c. to 1375, and the mean was 1316 c.c.

The skull D, from Denodera, was accompanied by many of the other bones of the skeleton, and, with the exception of the sternum, a few vertebræ and ribs, and some of the small bones of the hands and feet, the skeleton was in good order and complete.

*Pelvis*.—The pelvis had definite male characters, though in external dimensions it was small for an adult and considerably below the European standard. The breadth, 231 mm., exceeded the height, 189 mm., and the breadth-height index was 81.8. The subpubic angle was 68°. The tubercle of the iliac crest was moderate, the alæ were somewhat expanded, and the iliac fossæ scarcely transmitted any light. The pectineal lines and pubic spines were low; the muscular ridges were feeble. Each præ-auricular sulcus was a shallow, vertical groove. The transverse diameter of the pelvic brim exceeded the conjugate, and the pelvic index was 94.6, *i.e.* in the mesatipellic group. The obturator foramen had a relatively high index, 72.2. The anterior surface of the sacrum had a shallow concavity; the upper three vertebræ had sacral spines, but in the 4th and 5th the laminæ had not united mesially, and terminated in blunt processes which represented bifid spines. The 1st coccygeal vertebra was fused with the last sacral, but was not included in the measurement of sacral length. The breadth of the base of the sacrum slightly exceeded the length of the bone, and the index, 102, placed the bone in the lower term of the platyhiere group.



|                | A. V. D. | P. V. D. | Index. |                |
|----------------|----------|----------|--------|----------------|
| 1st Lumbar V., | 25 mm.   | 26 mm.   | 104·   | Special Index. |
| 2nd „ „        | 27 „     | 27 „     | 100·   |                |
| 3rd „ „        | 26 „     | 27 „     | 103·8  |                |
| 4th „ „        | 25 „     | 26 „     | 104·   |                |
| 5th „ „        | 25 „     | 23 „     | 92·    |                |
|                | 128 mm.  | 129 mm.  | 100·7  | General Index. |

In this spine the collective posterior vertical diameter of the bodies of the four lower dorsals was 8 mm. more than the anterior. In the lumbar vertebræ the collective posterior diameter was 1 mm. more than the anterior, instead of, as is customary in Europeans being several mm. less, and the general lumbar index was 100·7. The last lumbar was the only vertebra in which the anterior diameter of the body exceeded the posterior. The almost equality in the two diameters was such as to reduce the wedge-shaped form of the bodies to a minimum, and the spine, so far as its curvature was dependent on their shape and not on that of the intervertebral discs, was a straight spine, orthorachic.

*Ribs.*—These bones were not complete. Those present indicated a thorax of moderate dimensions and showed no special variations from the normal.

*Bones of the Upper Limb.*—The *Clavicles* were slender and with well-marked sigmoid curves; the muscular ridges were feeble, and the groove for the subclavius muscle was shallow. The articular surfaces were smooth and not extensive. The right bone was 140 mm. long, the left, 148 mm.

The *Scapulae* were also slender, and with the muscular markings relatively feeble; the axillary border was almost straight, the vertebral border was sharp, and the inferior angle was rounded; the spine and acromion were normal; the right coracoid notch was deep and wide. The right bone was 143 mm. in length and 101 in breadth; the left bone was 144 mm. long and 102 broad; the right scapular index was 70·6, the left was 70·8. The right infraspinous length was 103 mm., and the infraspinous index was 98; the left infraspinous length was 102 mm. and the index was 100.

*Shaft of Upper Limb.*—The humerus, radius, and ulna were slender, and with the muscular ridges moderate. In the humerus the musculo-spiral groove was shallow and the shaft showed scarcely any twist; in the right bone was a minute, intercondylar foramen, but neither bone had a supracondylar process. The ulnar articular surface for the head of the radius was large, and indicated free range of movement between the bones. The axis of the neck of the radius was set at an angle to that of the shaft. The axis of the shaft of the ulna was almost vertical. The interosseous interval between the bones was 17 mm. in its widest transverse diameter. The length of the bones was as follows:—

|  | Right.  | Left.   |
|--|---------|---------|
| Humerus, from head to tip of trochlea, | 339 mm. | 331 mm. |
| Radius „ „ „ styloid,                  | 257 „   | 257 „   |
| „ „ „ base „                           | 250 „   | 252 „   |
| Ulna from olecranon to tip of styloid, | 278 „   | 276 „   |
| „ „ „ lower articular surface,         | 274 „   | 272 „   |
| Radio-humeral (antebrachial) index,    | 75·8    | 77·6    |

The forearm was moderately long in proportion to the upper arm, and the resulting index is mesatikerkic.

*Shaft of the Lower Limb.*—The *Femur* was a well-shaped bone with the muscular processes and ridges moderately developed. The articular surface of the head had the extensor area faintly prolonged for a short distance outwards on the front and upper border of the neck. The anterior intertrochanteric line was thick and roughened and indicated a strong anterior ilio-femoral ligament and power of complete extension of the hip-joint. No flattening of the upper third of the shaft of the femur existed, and there was no external infratrochanteric ridge distinct from the gluteal ridge. The transverse diameter of the shaft a little below the small trochanter was 28 mm., and the antero-posterior diameter in the same plane was 23 mm.; the platymeric index was 82. At the middle of the shaft the transverse diameter was 25 mm. and the antero-posterior was 27 mm., which gave a pilastric index 108. The popliteal surface of the shaft was faintly concave. Each internal condyle had the articular surface behind prolonged a little above the upper border of the intercondylar fossa.

*Tibia.*—The head showed considerable retroversion; the internal condylar surface was concave and the external was concavo-convex. The vertical axis of the shaft formed with that of the head a distinct angle. The shaft was laterally compressed and with a sharp anterior border. In the right bone the antero-posterior diameter in the plane of the nutrient foramen was 31 mm., and the transverse diameter was 19 mm.; the shaft therefore was platyknic, with an index 61·3. The corresponding diameters in the left bone were 32 and 19 mm., and the index of platyknesia was 59·3. The astragalar articular surface was slightly prolonged on the anterior border of the lower end of the bone. The supero-external part of the tibial surface of the astragalus was slightly prolonged on the neck of that bone, but did not nearly reach the scaphoid articular surface.

*Fibula.*—This bone was slender and with feeble muscular markings.

|   | Right.  | Left.   |
|---|---------|---------|
| Femur, maximum length, . . . . .                            | 435 mm. | 435 mm. |
| „ oblique length, . . . . .                                 | 432 „   | 430 „   |
| Tibia from condylar surfaces to tip of malleolus, . . . . . | 370 „   | 369 „   |
| „ „ „ „ astragalar surface, . . . . .                       | 356 „   | 358 „   |
| Fibula, maximum length, . . . . .                           | 361 „   | 362 „   |

The inequalities in the length of the bones in opposite limbs were so slight that it will suffice to state the limb indices on the right side only. The tibio-femoral index was 82·4, so that the leg was relatively long and almost in the dolichoknemic group. The femoro-humeral index was high, 78, and the humerus was therefore relatively long. The intermembral index, 74, was also high in the Veddah skeleton.

As the descriptions by BUSK, FLOWER, DE QUATREFAGES and HAMY, BARNARD DAVIS, ROLLESTON, VIRCHOW, ARTHUR THOMSON, and PAUL and FRITZ SARASIN on the skulls of Veddahs have been considered in Part II. of these memoirs, it is not necessary again

to comment on them. It may suffice therefore to limit myself to a comparison of those previously recorded with this additional series. The crania in the present set were, as in those previously described, elongated, not keeled in the sagittal region, dolichocephalic, the height greater than the breadth. The face was low in relation to its height; the nose was usually platyrrhine or mesorrhine; the upper jaw was usually orthognathous; the orbital aperture trended to a high vertical diameter; the palato-alveolar arch was moderately wide. The mean cranial capacity in this series, 1316 c.c., was higher than in the men measured in Part II., 1201 c.c., and also higher than the mean, 1250, given in the memoir of the Messrs SARASIN.

As in the present series I have examined an almost complete skeleton, and as this opportunity seldom occurs, it will be of interest to compare it with specimens recorded in 1889 by Professor ARTHUR THOMSON,\* and with the more numerous examples subsequently described by the Messrs SARASIN in their monumental work on Ceylon.†

The bones were well formed, slender, and not strongly marked with ridges and processes for muscles. The height and breadth of the pelvis closely corresponded in THOMSON's and my specimens, and the breadth-height index, as well as in the males described by the SARASINS, ranged from 80·9 to 81·8. The index of the pelvic brim showed considerable variation. In eight men measured by the SARASINS the mean index was 89·9, in my specimen 94·6, and in these the transverse diameter exceeded the conjugate; but in THOMSON's specimen the conjugate was 3 mm. more than the transverse, and the index, 103, was dolichopellic.

In all the male skeletons it was seen that the collective depth posteriorly of the bodies of the lumbar vertebræ exceeded somewhat the depth anteriorly, and the lumbar curve, so far as it was occasioned by the bones, was concave anteriorly or kailorachic. In these skeletons the length of the forearm in relation to the upper arm was intermediate between Europeans and Negritos, and falls into the group which I have named mesatikerkic. The tibia was also long in relation to the femur, and the tibio-femoral index was dolichoknemic. In my specimen the intermembral index, 74, was much higher than in THOMSON's, 66·1, and in the SARASINS' specimens, 68·9, and must be regarded therefore as exceptional. In my skeleton and in those measured by the SARASINS the index of the tibial shaft was strongly platyknemic, but the mean of six tibiae measured by THOMSON gave an index 74·5, which showed that there was only slight lateral compression of the shaft. From the measurements of the Messrs SARASIN the mean stature of the Veddah men was 5 feet 2 inches, of the women 4 feet 10 inches.

#### TIBETANS. TABLE V.

In February 1905 I had the pleasure to receive from a former pupil, Major C. N. C. WIMBERLEY, I.M.S., two crania which he had collected when in Tibet as a member of the medical staff attached to the expedition to Lhasa under the command of Sir FRANK

\* *Jour. of Anthr. Inst.*, Nov. 1889.

† *Ergebnisse naturwissenschaftliche Forschungen auf Ceylon*; Wiesbaden, 1893.

E. YOUNGHUSBAND, K.C.I.E. One without the lower jaw was labelled as the skull of a typical inhabitant of Lhasa; the other, with the lower jaw attached, judging from the clothing and hair, was regarded as that of a Kham warrior from Eastern Tibet. They were picked up on the sites where engagements had been fought between the Tibetan forces and the British troops during the recent campaign.

#### LHASA. TABLE V.

The skull from Lhasa was that of an adult male. The cephalic index was 79·3, and the cranium, though not numerically brachycephalic, so closely approximated thereto in form and proportion, that it should be referred to that group.

*Norma verticalis*.—The outline was broadly ovoid, and the frontal longitudinal arc was 4 mm. longer than the parietal, the vertex was not flattened, and the cranium had a well-marked slope from the sagittal line to the parietal eminences. The side walls were slightly bulging; the parieto-occipital slope was steep, though not abrupt; the occipital squama was not flattened and projected slightly behind the inion. The parieto-squamous breadth was 7 mm. more than the interzygomatic. The skull was cryptozygous.

*Norma lateralis*.—The forehead was wide and flattened from side to side, it had only a slight backward slope, and the frontal eminences were moderate. The glabella and supraorbital ridges were not prominent. The nasion was not depressed. The bridge of the nose was low, flattened, and it projected so little at the tip that the concavity upwards was very shallow. The nasal bones were 26 mm. long. The interorbital width was 24 mm. The frontal longitudinal arc was 22 mm. longer than the occipital arc. The cranium rested behind on the cerebellar fossæ of the occiput (Pl. IX., figs. 46–48).

*Norma facialis*.—The floor of the nose was separated by a low, smooth border from the incisive region of the maxilla. The maxillo-nasal spine was feeble. The anterior nares were broad and indicated wide nostrils during life, but as the height of the nose was long in proportion, the nasal index worked out as mesorhine. The upper jaw projected a little and the index was mesognathous, 100. The maxillo-facial index, 55·5, was leptoprosopic, owing to the length of the superior maxilla. The canine fossæ were deep. The wide interzygomatic and intermalar diameters, the low, flattened, nasal bridge, the upper orbital border almost transverse, the malar border being in a plane only slightly posterior to the bridge of the nose, the nasio-malar index 105·1 and the markedly platyopic face were characteristic. The upper and outer borders of the orbit were not thick: the orbital aperture was rounded and megaseme. The palato-maxillary region was moderately wide and the index was brachyuranic. The teeth were fully erupted, not much worn, and not stained with betel.

The sagittal suture was partially obliterated at the obelion. The other sutures were distinct, the parieto-squamous had an epipteric bone. No 3rd condyl or paracondylar

process was present. The mastoids and inion were well marked. The vertical index, 73·7, was metriocephalic; as is customary in brachycephali, the height was not equal to the breadth, the cephalic index was 79·3, and the breadth-height index was platychamæcephalic. The intracranial capacity was 1520 c.c., on a par with the mean capacity in Europeans.

#### KHAM PROVINCE. TABLE V.

The province of Kham forms the eastern part of Tibet, and lies north-east of the Brahmaputra before that river makes the great bend to the south and west. The skull of the Kham warrior was dolichocephalic, with the length-breadth index 74·5. It was a powerful adult male, and had a lower jaw.

*Norma verticalis*.—The cranium was elongated and ovoid, in outline, with the parietal longitudinal arc 11 mm. longer than the frontal: the sagittal line was somewhat elevated, the parietal eminences were distinct, and the vault sloped steeply from the sagittal suture to these eminences, below which the side walls were vertical. The highest point of the temporal ridge was 32 mm. from the sagittal suture. The parieto-occipital slope was more gentle than in the skull from Lhasa, and the occipital squama bulged behind the inion. The stephanic diameter was 26 mm. less than the interzygomatic, and the skull was phænozygous.

*Norma lateralis*.—The forehead was receding, the frontal eminences were scarcely recognisable, and the frontal bone from the middle line to each temporal ridge sloped backwards. The glabella and supraorbital ridges were prominent, and the internal orbital process was thick: the nasion was a little depressed. The bridge of the nose, though not projecting, was not so wide and flattened as in the Lhasa skull, and was somewhat concave: the nasal bones were 27 mm. long, the interorbital width was 21 mm. The parietal longitudinal arc was 29 mm. longer than the occipital. The cranium rested behind on the cerebellar fossæ (Pl. X., figs. 49–51).

*Norma facialis*.—The line of separation between the floor of the nose and the incisive region was a low, smooth ridge, the maxillo-nasal spine was moderate, the anterior nares were narrow, and the nasal index was leptorhine. The nasio-mental and maxillo-facial indices were leptoprosopic. The upper jaw was orthognathic. The upper orbital border immediately external to the supraorbital notch was thin, and receded so that the outer orbital process and malar border were in a plane distinctly behind the bridge of the nose, the nasio-malar index was 107·3, and the face, instead of being flattened, was approximately mesopic. The orbital aperture was rounded with a megaseme index. The palato-maxillary region was wide, and the index was brachyuranic. The lower jaw had a square chin. The teeth had all erupted, were but little worn, and not stained with betel.

The cranial sutures were simple; three small Wormian bones were in the lambdoid suture. The parieto-squamous was broad and with a small right epipteric bone. A thick sphenoidal rostrum occupied the concave upper border of the vomer. The jugal





processes of the occipital were tuberculated, and there was no 3rd condyl. The vertical index, 76·6, was hypsicephalic, and the height exceeded the breadth; the cephalic index, 74·5, was dolichocephalic; the breadth-height index was hypsistenocephalic. The intracranial capacity was 1430 c.c.

#### PHYSICAL CHARACTERS AND AFFINITIES OF THE TIBETANS.

Although Tibet has for centuries been jealously guarded against access to Europeans, yet, before the recent British expedition, adventurous travellers had from time to time penetrated into the country, and a few had reached Lhasa, the capital. The physical characters of the people had to some extent been recognised by individual explorers; also by others, from opportunities of seeing Tibetans who had crossed the frontiers of India and China, and their affinities with the Mongolian type had been noted. An American traveller, Mr. W. W. ROCKHILL, who, starting from Peking, made two journeys through North-eastern and Eastern Tibet,\* regarded the people as essentially of one race, the purest representatives of which were the semi-nomadic, pastoral, tent-dwelling tribes known as the Drupa type. In the towns and villages, again, the people were mixed with other Asiatic races, with the Chinese in the north and natives of India in the south and west. He defines the Drupa type as follows: stature about 5 feet 5 inches; head, brachycephalic; cheek bones, high; nose, thick; nostrils, broad; beard, thin; hair, long, coarse, tangled; skin, light brown, but dark brown when exposed to the weather. He traversed the province of Kham, which he writes K'am or K'ambo, from north to south-east, and saw men having the nose thin and aquiline, the eyes large and hazel, the hair long and wavy or curly, as a type common in Eastern Tibet, but which he had never observed in Central or Western Tibet. He says there is nothing Mongol about them, and that they are good representatives of old Tibetan civilisation, possibly descendants of the Tang-hsiang of the sixth century of our era.†

Accompanying the recent British expedition were several journalists‡ who wrote picturesque descriptions of the fighting and other incidents of the campaign, the appearance of the country, the monasteries and the Lamas, the dress and habits of the people, but without giving much information on their physical characters. Mr EDMUND CANDLER, however, speaks of the people from the Kham province, who formed the bravest part of the Tibetan army, as wild, long-haired men, and he especially refers to Katsak Khasi as having comparatively aquiline features, which had not been "flattened out in youth."

\* *The Land of the Lamas: a Journey made in 1889*, London, 1891. *Diary of a Journey through Mongolia and Tibet in 1891 and 1892*, Washington, 1894. *Reports of the United States National Museum*, 1893.

† Between the years 1895 and 1899 Mr and Mrs RIJNHART resided in the border country of China and Tibet, and also travelled in North-eastern and Eastern Tibet, following almost the same route as Mr ROCKHILL. See *With the Tibetans in Tent and Temple*, by SUSIE C. RIJNHART, M.D., Edinburgh, 1901. This book being written by a lady, gives glimpses of interest into the domestic life of the Tibetans. See also *Tibet, the Country and its Inhabitants*, by F. GREYARD, pp. 72, 224, London, 1904, for an account of variations in the physical characters of the Tibetans.

‡ G. CANDLER, *The Unveiling of Lhasa*, London, 1905. PERCEVAL LONDON, *Lhasa, the British Mission*, London, 1905.

A fuller description of the people is given by Colonel L. A. WADDELL, C.B.,\* who acted as the chief medical officer to the mission. He observed two distinct types, the one round-headed, broad, flat-faced, and oblique-eyed, approximating to the pure Mongol from the Steppes; the other longer headed, with nearly regular features, a fairly shaped long nose with a good bridge, and but little of the Kalmuk eye; this type, he says, approximates more to the Tartars of Turkestan and the nomads of the Great Northern Plateau (Hör). Colonel WADDELL noticed that a large number of the nobility and higher officials belonged to the longer-headed, longer-nosed type, and so strongly resembled the Muhammadan Balti coolies, from the country bordering the Pamirs, that they could scarcely be distinguished from each other.† He was told that recent migrations of these nomad Tartars had taken place into Southern Tibet, east of the Yamdok lake, near to the borders of Bhutan. In stature the Tibetans of Lhasa were even less than the Chinese, but the men from Kham were quite up to the standard of the Chinese. The people were generally light chocolate in colour, though many of the better class were almost as fair as a South Italian. The hair was black, and worn by the men in pig-tails, but in the women it was smoothly brushed and parted in the middle.

Advantage was taken of the presence of the expedition to explore both Central Tibet and the upper waters of the Brahmaputra river, an account of which has been given by Captain C. G. RAWLING.‡ He describes the nomads of Central Tibet as of short stature, the men averaging from 4 feet 11 inches to 5 feet, the women being considerably shorter. The complexion was a sickly olive, the teeth ill formed and frequently protruding. The men allowed their black, greasy hair to grow long and wild, only a few straggling hairs projected from the corners of the mouth, but the women usually wore the hair plaited and decorated. Tai-Tso, the chief man at Pomla, had a low forehead, a flat nose, an enormous mouth, and deeply pigmented eye-balls set in narrow slits. At Shigatse, the Tashi Lama, the functionary second in authority in Tibet, was visited, and is described as being exceptionally fair in complexion, with high cheek bones and finely chiselled features: the hands were extremely white and the fingers long and thin.

The two skulls, which, through Major WIMBERLEY's courteous attention, I have had the opportunity of examining, are of especial interest, as they illustrate the two types of Tibetans which Colonel WADDELL has described. The Mongolian type of the skull from Lhasa was shown in the broadly ovoid, brachycephalic, platychamaecephalic form of the cranium, the width of the forehead, the interorbital breadth, the low, flattened bridge of the nose, the wide anterior nares, the interzygomatic and intermalar breadth, the malar border of the orbit being in almost the same transverse plane as the bridge of the nose, and the slight degree of projection of the upper jaw.

\* *Lhasa and its Mysteries*, London, 1905.

† Authorities are not agreed as to the characters of the people of Baltistan, a district to the north-east of Cashmere. Some regard them as showing a pronounced Mongolian type, others recognised Tibetan characteristics, whilst UJFALVY considered them to be almost Aryans (*Les Aryens*, by C. de Ujfalvy; Paris, 1896).

‡ *The Great Plateau*, London, 1905.

On the other hand the skull of the Kham warrior showed the longer-headed type. It was longer absolutely and also relatively to the breadth of the cranium than the Lhasa specimen, dolichocephalic and hypsistenocephalic. The bridge of the nose was not so wide or flattened and with a stronger profile, the anterior nares were narrower, the nasal index was leptorhine, the interorbital, intermalar, and interzygomatic breadths were less, the upper jaw was orthognathic and the cubic capacity was smaller. The cranial configuration of each skull was distinctive, and although only a single specimen of each type was under examination, the presence in Tibet both of a Mongolian and a longer-headed race was confirmed. The difference in the relation between the height and breadth of the cranium, which on previous occasions I have called attention to as not infrequently distinguishing the dolichocephali from the brachycephali, was present in these crania, for in the brachycephalic Tibetan the breadth was greater than the height, whilst in the dolichocephalic Kham warrior the height was greater than the breadth.

Some years ago Mr H. H. RISLEY published elaborate tables of measurements of natives of Bengal, taken by an assistant under his supervision during 1886-7-8.\* These tables included measurements of Tibetans arranged under three heads, Tibetans of Tibet, of Sikkim, and of Bhutan. In stature the Tibetans of Tibet averaged 164.2 c.m., those of Sikkim 162.9 c.m., those of Bhutan 162.1 c.m., and the mean range therefore was from 5 feet 3 $\frac{3}{4}$  inches to 5 feet 4 $\frac{1}{2}$  inches. The indices computed from certain measurements of the head and face are given below.

| Tibetans of Tibet.   | Of Sikkim.   | Of Bhutan.  |
|--|--|---|
| <i>Cephalic Index.</i>   |  |   |
| 20 from 80 to 88.9<br>6 „ 77.5 „ 79.9<br>9 „ 75 „ 77.5<br>2 at 72.9 and 74.2 | 29 from 80 to 93.2<br>4 „ 78.1 „ 79.5<br>1 at 77.2                           | 9 from 80 to 91.2<br>5 „ 77.5 „ 79.9<br>4 „ 75 „ 77.5<br>1 at 72.6          |
| 37, Mean of the series, 80.5   | 34, Mean, 82.7   | 19, Mean, 80.2  |
| <i>Nasal Index.</i>  |  |   |
| 9 from 81.1 to 90.3<br>13 „ 70.3 „ 79.6<br>14 „ 62.5 „ 70                    | 2 were 81.8 and 86<br>18 from 71.1 to 78.8<br>13 „ 61.8 „ 69.8<br>1 was 58.4 | 3 from 91.1 to 102.6<br>6 „ 80 „ 86.9<br>7 „ 70.1 „ 79.1<br>3 „ 64.8 „ 65.3 |
| 26   | 34   | 19  |
| <i>Nasio-Malar Index.</i>  |  |   |
| 13 from 110.1 to 113.3<br>15 „ 107.9 „ 109.8<br>6 „ 103.4 „ 107.4            | 10 from 110 to 112<br>13 „ 107.5 „ 109.7<br>8 „ 103.2 „ 107.4                | 2 from 113.3 to 115<br>5 „ 107.5 „ 109.4<br>3 „ 105.8 „ 107.2               |
| 34   | 31   | 10  |

\* *The Tribes and Castes of Bengal, Anthropometric Data*, vol. i. p. 273, *es.*, Calcutta, 1891.

An inspection of the above table shows that a wide range of variation in all these indices was found in the persons measured. The cephalic index in the Tibetans of Tibet ranged from below 75 in two skulls to 80 and upwards, 88·9, in twenty specimens, *i.e.* from definite dolichocephalic to hyperbrachycephalic proportions. In the Tibetans of Bhutan the range was equally great, but in the Tibetans of Sikkim no head was dolichocephalic. In each of the three groups the mean index was brachycephalic, especially in the Sikkim Tibetans, and the rounded form of head preponderated. The presence, however, of a small proportion of heads either dolichocephalic or in the lower term of the mesaticephalic group, leads one to think that the assistant who made the measurements had in some cases included persons whose race characters had not been discriminated with sufficient exactness, a conclusion which is also supported by the analysis of the nasal indices,\* which ranged from platyrrhine, 85 and upwards, to leptorrhine below 70, and of the nasio-malar indices which proved the presence of a platyopic Mongolian type as well as pro-opic faces approximating to the Caucasian form.

Subsequently to the appearance of Mr RISLEY'S tables, Lieut.-Col. WADDELL published some measurements made by himself of eight Tibetans from the lower Tsang-po.† The mean stature was 5 feet 4½ inches, the mean cephalic index was 81·3, and the mean nasal index 82·2. The lowest cephalic index was 77·7, the highest 86·1; five were above 80 and three in the upper term of the mesaticephalic group. The brachycephalic and mesorrhine character of these people therefore was distinct.

Whilst there is no difficulty in associating the Tibetans generally with the Mongolian type of head and face, the affinities and derivation of the long-headed people of the Kham province will require more consideration. The position of this province in the east of Tibet brings it into relation with the ranges of mountains at the north of Burma, in which arise the great rivers that flow south into the Bay of Bengal, as well as with the Brahmaputra as it bends north and west to reach the north base of the Himalayas and to join apparently the Tsang-po river in the province of Lhasa in Tibet. This extensive range of country is occupied by people speaking closely connected languages and dialects, which philologists name the Tibeto-Burman stock.

Mr G. A. GRIERSON has contributed to the recently published *Census of India* an important chapter on the Languages of India.‡ He regards the Tibeto-Burman stock as a subfamily of the Indo-Chinese group, the original home of which was probably North-western China, between the upper waters of the Yang-tse-Kiang and the Hoang-ho. From the Tibeto-Burman stock of people one branch, he says, entered Tibet, offshoots from which settled on the southern slopes of the Himalayas; others followed the course of the Brahmaputra as far south as the Garo Hills and Tipperah; others occupied the

\* The division of the nasal index, computed from measurements during life, is as follows: leptorrhine, below 70; mesorrhine, 70–85; platyrrhine, 85 and upwards. In the skull itself the division is leptorrhine below 48; mesorrhine, 48–53; platyrrhine above 53.

† "The Tribes of the Brahmaputra Valley," *Journal of the Asiatic Society of Bengal*, vol. lxx. part iii. 1900, Calcutta, 1901.

‡ *Census of India*, 1901, vol. i. part 1, by H. H. Risley, C.I.E., and E. A. Gait, I.C.S., Calcutta, 1903.

Naga Hills, the valley of Manipur, and the head-waters of the Chindwin and Irrawaddy rivers. From the last-named region offshoots colonised the Chin Hills, Lushai land, Cachar, and the valley of the Irrawaddy, and a swarm called the Tai conquered the mountainous country to the east of Burma.

It will therefore be of interest at this stage to consider the physical characters of the people living in the Tibeto-Burman region, and the configuration of their skulls. Although the tribes occupying the mountains are warlike savages, so that opportunities for observation and the acquisition of specimens occur only occasionally, yet some facts are at our disposal.

Through the courtesy of several of my former pupils, I was able to examine and describe, in Part I. of this series of memoirs,\* nineteen skulls of the Naga, Chin, and Lushai mountaineers, and I would refer to it for a detailed description. Six Naga skulls, six Chins, and three Lushais were either dolichocephalic or approximated thereto, and may fitly be compared with the skull from the Kham province.† As with the Kham skull the terms elongated and ovoid apply to the outline of their crania in the *norma verticalis*, though in some the breadth in relation to the length was greater than in others. In the Kham specimen the upper jaw was orthognathic, a character present in the majority of the mountaineers. The face was broad, and in the Kham skull the interzygomatic diameter was 131 mm., something more than the mean of the Chin-Lushais, 127, but not quite so great as the mean of the Nagas, 134. In the Kham the nasio-malar index was 107·3, in the mountaineers it ranged from 104·8 to 110, with the mean 107·5: a close correspondence therefore existed in the degree of projection of the bridge of the nose beyond the plane of the malar borders of the orbits. In the Kham skull the nasal index was leptorhine, in the mountaineers four were leptorhine, seven mesorhine, four platyrhine, a range of variation which, through paucity of specimens, could not be determined amongst the Khams. As the features of resemblance correspond in so many important respects in the skull of the Kham with those of the people of the Naga, Chin, and Lushai Hills, craniology lends support to the opinion, based on affinities of language, that they belong to a common stock, for the points of difference are no greater than may be found in the skulls of people of the same race (Pl. X., figs. 51-53).

In further extension of this question I may refer to two skulls obtained in an old cemetery in Upper Burma, also described in Part I. of this series of memoirs,‡ in which the dolichocephalic form and proportions and the mean leptorhine nasal index, at once distinguished them from the brachycephalic type of the modern Burmese people. These skulls therefore in all probability may be regarded as representing the offshoot of the Tibeto-Burman stock, which, many centuries ago, penetrated into Burma from the mountainous districts to the north, and in course of time became to a large extent displaced by a brachycephalic people, allied in all probability to the Shans and Chinese.

\* *Trans. Roy. Soc. Edin.*, vol. xxxix. p. 703, 1899.

† Two Nagas, and two from the South Lushai Hills, were brachycephalic, and are not included in the comparison.

‡ *Op. cit.*, p. 736, pl. iii. fig. 14.

Since the publication of Part I., Colonel WADDELL's memoir on the *Tribes of the Brahmaputra Valley* has appeared, and additional observations and measurements taken by himself are now available for comparison. The *Abors* at the north-east extremity of the Brahmaputra valley, the *Arlengs* between the south bank of the Brahmaputra and the Kachar Hills, the *Bhotiyas* of Bhotan from the eastern end of the Himalayas, the *Kachari* or *Bodos* in the central Brahmaputra valley, the *Kasia* in Assam, the *Khumbu* and *Khiranti* of Eastern Nepal, the *Koch* between lower Assam and North-eastern Bengal, the *Kukis* from the Kuki-Lushai Hills, the *Mandé* or *Garo* in the mountains between Burma and the Brahmaputra, the *Mishing* or *Miri* on the north bank of that river up to the Dihong, the *Lepchas* or *Rong* from the Sikkim Himalayas, are all stated to have Mongoloid features. They are by no means uniform in the relations of the length and breadth of the head, or in that of the height of the nose and width of the nostrils, as is shown in the following table, which states the mean of Colonel WADDELL's measurements :—

|                     | Ceph. Index. | Nasal Index. | Stature.    |
|---------------------|--------------|--------------|-------------|
| Abor, . . . . .     | 77.2         | 90.7         | 5 ft. 2 in. |
| Arleng, . . . . .   | 77.9         | 85.1         | 5 „ 4½ „    |
| Bhotiyas, . . . . . | 80.3         | 77.1         | 5 „ 3¼ „    |
| Kachari, . . . . .  | 78.5         | 88.1         | 5 „ 3 „     |
| Kasia, . . . . .    | 78.7         | 86.4         | 5 „ 1½ „    |
| Khumbu, . . . . .   | 82.4         | 85.7         | 5 „ 2¼ „    |
| Koch, . . . . .     | 76.8         | 80           | 5 „ 2½ „    |
| Kukis, . . . . .    | 76.5         | 91           | 5 „ 2¼ „    |
| Lepchas, . . . . .  | 80.6         | 78.3         | 5 „ 2 „     |
| Mandé, . . . . .    | 76           | 95.1         | 5 „ 2¼ „    |
| Mishing, . . . . .  | 80.9         | 84           | 5 „ 1½ „    |

In the account which I gave in Part I. of the natives of the Chin, Lushai, and Naga Hills, I quoted statements made by those who had travelled amongst them, and especially referred to the Mongoloid characters of the face so frequently described. I also quoted the remark made by Colonel LEWIN, that amongst the Lushais were faces not bearing marks of Mongolian descent, whilst Colonel WOODTHORPE stated that the Angami Nagas had sometimes aquiline features and fair, ruddy complexions.

In my description of the Chins, Lushais, and Nagas I directed attention to the presence of a Mongolian type of feature in certain hill tribes where the customary form of skull was dolichocephalic or approximated thereto, so that the Mongoloid face was not therefore exclusively associated with the brachycephalic form of skull. Colonel WADDELL's measurements require to be examined in their bearing on this question. The cephalic index of the heads of persons whose Mongoloid features were recognised by so trained an observer, ranged from 76 to 82.4, and the nasal index ranged from 78.3 to 95.1. As the cephalic index computed from measurements of living persons is higher than if taken from the skull itself, had the index in the same persons been computed from the skull, it would probably have ranged from 74 to about 80, which would have included all the three groups into which skulls are arranged in accordance with

differences in this index. As the width of the nostrils is much greater than that of the anterior nares, whilst the height of the nose is little more when measured in the face than in the skull, the nasal index computed from the face is necessarily materially greater than when obtained by measuring the skull. Many therefore of the people of these tribes would have had skulls whose proportions were dolichocephalic or approximated thereto, and WADDELL's observations on living persons are confirmatory of the conclusions which I had previously formed from the study of the skull.

#### SEISTANIS: TABLE V.

In the year 1903 an expedition, under the command of Sir ARTHUR H. MACMAHON, K.C.I.E., was despatched by the Government of India to Seistan to act as an arbitration Commission to adjust the boundary between Persia and Western Afghanistan, and the distribution of the water of the Helmand river. Major T. WALTER IRVINE, I.M.S., was the medical officer in charge, and he collected on the site of the ancient city of Zahidan three human skulls, buried under a mound of sand frequently shifting through the prevalence of strong winds. Two of these were sent by him to Professor CHIENE of Edinburgh, who presented them to the University Museum, and the third was forwarded to the Anthropological Institute of London, from whom I received it. Zahidan, from the extensive ruins which mark its site, had evidently been a city of great importance and the seat of a bygone civilisation. It was destroyed by Timour during his advance into India in 1367. It is also interesting to note that Seistan was on the route followed by Alexander the Great and the Greeks in the famous march to the Indus, when he invaded India in 327 B.C.

The skulls were those of adults, two males, A and B, and one female, C; the lower jaw was absent in each specimen. The males differed materially in character from the female, and require a separate description. They were massive skulls, well proportioned, and unusually heavy: A weighed 1 lb. 9½ oz., B 1 lb. 15¾ oz.

*Norma verticalis*.—In A the outline was rounded, and the cranium was of such a breadth, 148 mm., that though the length was 179 mm., the cephalic index was 82·7, distinctly brachycephalic. B had not the outline so rounded, for the breadth was less, and the length, in part owing to the prominent glabella, was 183 mm.; the cephalic index therefore was 78·7, in the higher term of the mesaticephalic group. The outline in both from side to side across the vertex was a wide, rounded arch. The sagittal region was not ridged, the parietal eminences were fairly distinct, and the side walls bulged in the squamous region. The parieto-occipital surface sloped steeply downwards, without sign of artificial flattening. The skulls were cryptozygous.

*Norma lateralis*.—In A the frontal eminences were prominent, the forehead was only slightly inclined backwards, the glabella and supraorbital ridges were moderate and the nasion was not depressed. In B the frontal eminences were distinct, the slope of the forehead was more marked, the glabella and supraorbital ridges were very

prominent, and the nasion was much depressed. The bridge of the nose was 15 mm. long in A, a little longer in B, and in both slightly concave, sharp, projecting, and not flattened. The interorbital diameter in A was 24 mm., in B 26 mm. In A the parietal longitudinal arc was much the shortest, and the frontal slightly exceeded the occipital. In B the occipital was short and the frontal and parietal longitudinal arcs were almost equal. In A the cranium rested behind on the cerebellar fossæ of the occiput, in B on the mastoids (Pl. XI., figs. 55-57).

*Norma facialis.*—In both skulls the nasal floor was separated by a sharp ridge from the incisive fossæ, which, as well as the canine fossæ, were markedly hollow. In both the maxillo-nasal spine was strong. The height of the nose was more than double the width of the anterior nares, and the nasal index was leptorhine. In A, owing to the height of the maxilla and the flattened zygomata, the maxillo-facial index was remarkably high, and both skulls were leptoprosopic. The upper jaw was orthognathic. In A the orbital aperture was rounded and megaseme, but in B, owing to the development of the supraorbital ridges, the height of the aperture was diminished and the index was microseme. In A the palato-maxillary arch was very deep, 17 mm. opposite the 2nd molar tooth, the arch was wide, and the maxillo-premaxillary suture was distinct. The teeth were partially worn and not stained with betel. In B the arch was more elongated and comparatively shallow, but the molar alveoli were absorbed.

In both the male skulls some small Wormian bones were in the lambdoid suture. The other sutures were moderate in the denticulation. In A they were not obliterated, in B they were partially ossified: in both the parieto-squamous sutures were broad and there were no epipteric bones. In A the spinous processes were ossified to the temporals. In both the mastoids were massive, there was no 3rd condyl or para-condylar processes, and the inion and curved lines were moderate. In both the vertical index was hypsicephalic; in each skull the height was less than the breadth, and the corresponding index was platychamæcephalic. Though in B the cephalic index was less than the lower brachycephalic limit, the skull in its general form and characters approximated much more to the brachycephali than to the dolichocephali. The cranial capacity of A was 1510 c.c., of B 1385 c.c.

Skull C was to all appearance that of a woman. It was much smaller than A and B, the parietal eminences were prominent, the mastoids and inion were feeble, and the orbital borders were sharp. Although the cerebellar part of the occiput and the left zygomatic arch were broken off and lost and the lower jaw was absent, this small skull was unusually heavy and weighed 1 lb. 9½ oz., or within ¼ oz. of the male skull A.

*Norma verticalis.*—The cranium was elongated, pentagonal in outline, and relatively narrow: the cephalic index was 75.3, essentially dolichocephalic, though fractionally higher than its numerical limit. The breadth, owing to the projecting eminences, was greatest in the parietal region, the sagittal line was somewhat elevated in front, though grooved behind the obelion, and the slope outwards from it gave a roof-like character



to the vertex. The parieto-occipital slope was gradual, and the occipital squama projected behind the inion. The zygomatic arches were flattened, and the skull was cryptozygous. The stephanic diameter was 6 mm. less than the asterionic.

*Norma lateralis.*—The forehead inclined backwards and upwards, the glabella and supraorbital ridges were moderate; the nasion was not depressed; the bridge of the nose was 19 mm. long, straight, feebly projecting though not flattened; the interorbital diameter was 22 mm. The cranium rested behind on the cerebellar occipital fossæ. The frontal and parietal longitudinal arcs were almost equal; the injury to the occipital bone did not admit of the occipital arc being measured (Pl. XI., figs. 58–60).

*Norma facialis.*—The floor of the nose was separated from the incisive region by a sharp ridge: the maxillo-nasal spine was moderate. The height of the nose in proportion to the width of the nares was less than in A, and the nasal index, 47·8, was leptorhine; the canine fossæ were deep; the upper jaw was not projecting, and the index was orthognathous, 88·3. The orbital borders were sharp, and the aperture was roundish and megaseme, 97·1. The palato-maxillary arch was shallow, and too much injured to measure. The teeth had been lost.

The cranial sutures were on the whole simple, and not obliterated; the parieto-squamous were broad; the left asterion had a Wormian bone. The spinous processes were not ossified to the temporals. No special variations were noted. The vertical index, 77·6, was hypsiccephalic, and higher than the cephalic index, 75·3, which was fractionally above the numerical dolichocephalic limit; the breadth-height index was hypsistenocephalic. The cranial capacity of C was low even for a woman, only 1060 c.c., but the dimensions generally of the skull were small and indicated a person of low stature.

It is not possible definitely to associate the skulls collected by Major IRVINE with the races to which they belonged. Seistan, from its relation to the frontiers of Persia, Afghanistan, and Baluchistan, is liable to have its people intermingled with Persians, Afghans, and Baluchis. Further, the country, having been subjected to successive invasions from the north, other tribes and races may have settled there. Neither is it possible to state definitely to what period the skulls should be referred. They were found lying loose in a mound of sand, and apparently without any objects along with them which could give a key to their age. As is well known, dry sand is a remarkable preservative of bones, and from their bleached appearance they had probably at times, when the sand shifted, been exposed to the sun. As they were found on the site of the city of Zahidan, which was destroyed more than five hundred years ago, they might have been the skulls of its ancient inhabitants; but on the other hand they might have belonged to people who in much more recent years had camped on the site.

The evidence of the race and date of burial being therefore so incomplete, one has, in attempting to discriminate their history, to rely upon the characters of the skulls themselves.

The malès belonged to large-brained people, with massive heads, brachycephalic, or approximating thereto. The nose was not flattened, the nasal index was low, the face

was high, and the nasio-malar index, 114, gave a projecting pro-opic character to the profile. Although the locality in which they were found and the brachycephalic form of the cranium would lead one to think that they might have had racial affinities with the Mongolians, the facial characters showed a definite departure from the Mongolian type. In the female, again, the elongated skull, its dolichocephalic proportions, low nasio-malar index, 106·7, and platyopic face, presented differences from the males much more than could be regarded as sexual, and seem to justify the conclusion that it was of another race.

As regards the Baluchis, or Bilochs, Mr RISLEY's table\* of measurements of sixty men show that in thirty-two the cephalic index exceeded 80, in one of which the index reached 95·4; in twenty-two the index ranged from 75·3 to 79·4, ten of which were above 77·5, whilst six were below 75. The prevailing type was brachycephalic or approximated thereto. The nasal index was leptorhine. The nasio-malar index was high, and averaged 117·9.

Measurements taken by Mr JOHN GRAY of the heads of the Indian soldiers † who were in London at the time of the Coronation, may perhaps assist in throwing further light on the affinities of these crania from Seistan. Mr GRAY found that the Afridis had a mean cephalic index 74·2, the Afghans 76·3, the Muhammadan Punjabis 72·7, the Sikhs 73·1, all of whom therefore had dolichocephalic heads. The dolichocephalic skull C may possibly be that of an Afghan or Afridi woman.

On the other hand the Baluchi soldiers, thirteen in number, measured by Mr GRAY, had the mean cephalic index 83·4. When the necessary reduction is made for the thickness of the soft parts, this index closely approximates to the mean of the skulls A and B in this description, and expresses the brachycephalic character, though much less pronounced than in the Mongolian inhabitants of Central Asia. When it is kept in mind that the Baluchis, owing to the uncertain water supply, the character of the climate, and the conformation of their country, are a nomadic people, it is not unlikely that they may frequently cross the frontier into Seistan, and their skulls consequently be occasionally found in that province.

#### SAGITTAL SECTIONS TABLES VI., VII.

In previous memoirs on the skull published in the *Challenger Reports* and in the *Transactions* of this Society, ‡ I have reproduced tracings of sagittal sections which showed the contour of crania near the mesial plane. Lines radiating from the basion were drawn to definite anatomical points on the surface of the skull, also other lines which at their intersections enabled angles to be measured. In this memoir similar

\* *Tribes and Castes of Bengal, Anthropometric Data*, vol. ii., Table I., p. 815.

† *Man*, iii. p. 69, 1903.

‡ *Challenger Reports*, part xxix., 1884; *Trans. Roy. Soc. Edin.*, vol. xl. part i., 1901; part iii., 1903.

sections of additional skulls are given with radial and other lines and measurements. As suggested in my paper on *Pithecanthropus erectus*,\* an antero-posterior nasio-tentorial plane, from the nasion to the upper border of the groove for the lateral sinuses,† expressed the division of the cranial cavity into an upper cerebral part, occupying the large space above the tentorium, orbital plates of the frontal, cribriform plate of the ethmoid and great wing of the sphenoid; and a basal part in which the cerebellum, pons, and medulla are lodged. The division of the radial lines by the line *nt*, which indicates the nasio-tentorial plane, marks off the upper cerebral part from the lower basal part, and the diameter of the cavity where each radial line touches the inner table of the skull is stated in Table VI. Further, a line drawn from the nasion to the bregma *nbr*, as has been done by Professor CUNNINGHAM,‡ gives the chord of the arc of the frontal bone; the depth of the arc is measured by erecting a perpendicular from the chord to the most projecting part of the frontal, whilst the depth of the cerebral space, which the chord and arc enclose, is obtained by measuring the length of this perpendicular to the point where it touches the inner table of the bone. The fronto-occipital diameter of the cerebral cavity, and the diameter of the cavity from the perpendicular radius to the frontal and occipital poles respectively, are given in Table VI. The lines intersecting the cranial cavity subdivide it into regions which indicate approximately the position and relative magnitude of important divisions of the brain. The area of the cerebrum below is defined generally by the nasio-tentorial plane. Though the plane of the foramen magnum, from which the perpendicular radius is drawn at right angles, varies in its inclination in different skulls, and is not necessarily parallel to the horizontal plane of the head, the tentorio-perpendicular section of that radius has a general relation to the fissure of Rolando and to the posterior limit of the frontal lobe. The space between the tentorio-perpendicular and tentorio-lambdal radii is associated with the parietal and upper part of the temporal lobes, and the region behind the tentorio-lambdal radius with the occipital lobe. The influence exercised by the frontal sinus on the curvature of the inner and outer tables is shown in the figures reproducing the sections, as well as the extent of the air sinus above the glabella. For purposes of comparison Table VI. includes corresponding measurements of some of the skulls described in Part II. of this series of memoirs,§ details of which were not at that time given, also measurements of sagittal sections of two skulls described in my memoir on the Craniology of the People of Scotland.||

\* *Journ. Anat. Phys.*, vol. xxix. p. 424, 1895.

† Theinion on the outer table is, as a rule, lower down than the upper border of the groove for the lateral sinus on the inner table which marks the attachment of the tentorium, hence the term nasio-tentorial plane is to be preferred to nasio-inial plane.

‡ "The Brain of the Microcephalic Idiot," *Scientific Transactions of the Royal Dublin Society*, vol. v. p. 344, fig. 16, 1895.

§ The Veddah, Gond, Munda, Bhúmij, and Pan Cole skulls are described and measured in Part ii., Tables i., iii., iv., ix., *Trans. Roy. Soc. Edin.*, vol. xl., 1901.

|| *Trans. Roy. Soc. Edin.*, Tables iii., xiii., xvii., 1903.

TABLE VI.

*Sagittal Sections.*

|  | Tamil<br>Sudra, K.<br>C. IX. 74-3.<br>Fig. 61. | Thug, 130.<br>C. IX. 75-4.<br>Fig. 62. | Thug, 131.<br>C. IX. 74.<br>Fig. 63. | Veddah, A.<br>C. IX. 67.<br>Figs. 27, 64. | Gond, A.<br>C. IX. 69-4.<br>Fig. 30. | Munda,<br>I.M. 26.<br>C. IX. 70-9.<br>Fig. 36. | Bhūmij,<br>I.M. 18.<br>C. IX. 72-7.<br>Figs. 20-22. | Pan Cole,<br>I.M. 55.<br>C. IX. 73-8. | Mid-<br>Lothian,<br>Rx.<br>C. IX. 80-1. | Shetland<br>C. IX. 75-1 |
|--|--|--|--------------------------------------|---|--------------------------------------|--|---|---------------------------------------|---|-------------------------|
| Basi-inial radius, .   | 76 mm.   | 76 mm.                                 | 79 mm.                               | 75 mm.                                    | 71 mm.                               | 78 mm.   | 80 mm.  | 78 mm.                                | 89 mm.                                  | 91 mm.                  |
| „ -occipital radius, .   | 100 „  | 103 „                                  | 95 „                                 | 98 „                                      | 104 „                                | 94 „   | 107 „   | 109 „                                 | 104 „                                   | 116 „                   |
| „ -lambdal, „  | 115 „  | 112 „                                  | 110 „                                | 107 „                                     | 110 „                                | 116 „  | 113 „   | 122 „                                 | 117 „                                   | 123 „                   |
| „ -perpendicular<br>radius, .  | 143 „  | 132 „                                  | 131 „                                | 128 „                                     | 139 „                                | 133 „  | 133 „   | 125 „                                 | 136 „                                   | 145 „                   |
| „ -bregmatic radius, .   | 141 „  | 130 „                                  | 132 „                                | 127 „                                     | 139 „                                | 128 „  | 131 „   | 126 „                                 | 134 „                                   | 141 „                   |
| „ -glabellar „   | 104 „  | 109 „                                  | 104 „                                | 107 „                                     | 113 „                                | 111 „  | 103 „   | 110 „                                 | 105 „                                   | 118 „                   |
| „ -nasial „  | 94 „   | 105 „                                  | 96 „                                 | 98 „                                      | 104 „                                | 101 „  | 95 „  | 101 „                                 | 99 „                                    | 110 „                   |
| „ -alveolar „  | 90 „   | 97 „                                   | 95 „                                 | 100 „                                     | 102 „                                | 95 „   | 92 „  | 99 „                                  | 91 „                                    | ...                     |
| Nasio-tentorial plane, .   | 167 „  | 167 „                                  | 165 „                                | 171 „                                     | 170 „                                | 171 „  | 175 „   | 176 „                                 | 172 „                                   | 191 „                   |
| Tentorio-bregmatic line,<br>„ -perpendicular<br>line, .                                | 97 „   | 90 „                                   | 90 „                                 | 81 „                                      | 96 „                                 | 84 „   | 96 „  | 88 „                                  | 89 „                                    | 99 „                    |
| „ -lambdal line, .   | 98 „   | 92 „                                   | 91 „                                 | 81 „                                      | 97 „                                 | 90 „   | 98 „  | 86 „                                  | 93 „                                    | 106 „                   |
| „ -occipital „   | 61 „   | 62 „                                   | 56 „                                 | 54 „                                      | 56 „                                 | 65 „   | 68 „  | 73 „                                  | 62 „                                    | 77 „                    |
| Nasio-bregmatic chord,<br>Perpendicular there-<br>from to outer table<br>of frontal, . | 24 „   | 47 „                                   | 22 „                                 | 27 „                                      | 45 „                                 | 19 „   | 63 „  | 43 „                                  | 37 „                                    | 62 „                    |
| The same to inner table,   | 111 „  | 108 „                                  | 106 „                                | 106 „                                     | 112 „                                | 97 „   | 116 „   | 110 „                                 | 109 „                                   | 120 „                   |
| Fronto-occipital dia-<br>meter of cerebral<br>cavity, .                                | 29 „   | 22 „                                   | 28 „                                 | 27 „                                      | 27 „                                 | 21 „   | 31 „  | 29 „                                  | 27 „                                    | 28 „                    |
| From perpendicular<br>radius to frontal pole<br>of cavity, .                           | 23 „   | 16 „                                   | 21 „                                 | 18 „                                      | 18 „                                 | 17 „   | 25 „  | 19 „                                  | 22 „                                    | 21 „                    |
| From perpendicular<br>radius to occipital<br>pole of cavity, .                         | 158 „  | 151 „                                  | 160 „                                | 162 „                                     | 160 „                                | 162 „  | 168 „   | 166 „                                 | 161 „                                   | 179 „                   |
|  | 83 „   | 84 „                                   | 88 „                                 | 91 „                                      | 86 „                                 | 89 „   | 94 „  | 88 „                                  | 82 „                                    | 93 „                    |
|  | 75 „   | 67 „                                   | 72 „                                 | 71 „                                      | 74 „                                 | 73 „   | 74 „  | 78 „                                  | 79 „                                    | 86 „                    |

The measurements obtained from the sagittal sections enable one to ascertain the diameters of the cerebral portion of the cranial cavity in two dimensions; the diameter between the frontal and occipital poles gives the length, whilst the tentorio-bregmatic, -perpendicular, -lambdal, and -occipital diameters give the height in the named regions. Although the third or breadth dimension cannot be obtained from the sections, the two dimensions which have been measured will give some conception of the length and height of the cranial cavity occupied by the cerebrum.

The length and collective height dimensions separately stated are as follows:—

|           | Tamil. | Thug, 130. | Thug, 131. | Veddah. | Gond. | Munda. | Bhūmij. | Pan Cole. | Mid-<br>Lothian. | Shetland. |
|-----------|--------|------------|------------|---------|-------|--------|---------|-----------|------------------|-----------|
| Length, . | 158    | 151        | 160        | 162     | 160   | 162    | 168     | 166       | 161              | 179       |
| Height, . | 280    | 291        | 259        | 243     | 294   | 258    | 325     | 281       | 281              | 344       |
| Total, .  | 438    | 442        | 419        | 405     | 454   | 420    | 493     | 447       | 442              | 523       |

Eight of these crania are from natives of India and Ceylon, and, with the possible exception of the Thugs, are Dravidians. They range in the length-height diameters from 405 in the Veddahs to 493 in the Bhúmij skull.

In one of the Thugs, No. 130, these diameters were equal to the same measurements in the Mid-Lothian skull, but, as the latter was brachycephalic, its breadth was greater in the frontal and parieto-squamous regions, and the cubic capacity was 1440 c.c. as compared with 1218 in the Thug.

The perpendicular line drawn from the naso-bregmatic chord to the inner table of the frontal arc in the Bhúmij skull, in which the frontal region was well arched, was 25 mm. In the Veddah, Gond, Múnda, and Pan Cole crania it was below 20; in the Thug, No. 130, in which the forehead was retreating, it was only 16 mm.; but in No. 131 it was 21 mm., which, as well as the length to a point on the outer table, was the same as the corresponding diameters in the large Shetland cranium.

Attention has been called by craniologists to the relation of the three factors which make up the longitudinal circumference of the skull. Two of these, viz. the length of the foramen magnum and the basi-nasal diameter, together constitute the base line of CLELAND,\* and their proportion to the total longitudinal arc has been estimated. In this memoir I have made a similar calculation, which is embodied in Table VII., and I have added, for purposes of comparison, dimensions of Scottish and Australian skulls given in my memoir on Scottish crania.†

TABLE VII.

|  | Tamil<br>Sudras. | Pariahs. | Badaga. | Thugs. | Veddahs. | Lhasa. | Kham. | Seistanis.<br>A. B. | Scottish. | Aus-<br>tralian. |
|--|------------------|----------|---------|--------|----------|--------|-------|---------------------|-----------|------------------|
| ‡ Mean base line,                      | 132·3            | 134·2    | 135     | 133    | 130      | 127    | 140   | 143                 | 134·3     | 139·8            |
| „ longitudinal<br>arc,                 | 362·4            | 357·7    | 376     | 364    | 360      | 382    | 374   | 364·5               | 376·5     | 380·4            |
| „ longitudinal cir-<br>cumference,     | 494·7            | 492      | 511     | 497·3  | 491      | 509    | 514   | 507·5               | 510·8     | 520·2            |
| „ base line to long.<br>arc,           | 2·7              | 2·6      | 2·78    | 2·7    | 2·7      | 3      | 2·6   | 2·5                 | 2·8       | 2·7              |
| „ base line to long.<br>circumference, | 3·7              | 3·6      | 3·78    | 3·7    | 3·7      | 4      | 3·6   | 3·5                 | 3·8       | 3·7              |

The range in the proportion of base line to the longitudinal arc varied from 3 in the Lhasa to 2·5 in the Seistani, the latter of which had relatively the longest base line. The Lhasa skull in the proportion of the arc to the base line was considerably greater than in the skull from the Kham province and than the mean of the Scottish skulls. Little variation existed in the proportion of base line to arc in the Indian crania, Tamil Sudras, Pariahs, Badaga, Thugs and Veddahs, which were approximately 2·7, about the same figure as in the Australian crania. The proportion of the base line

\* CLELAND, *Philosophical Transactions*, p. 122, 1869, CUNNINGHAM, *Transactions Royal Dublin Soc.*, vol. v. 1895.

† TURNER, *Trans. Roy. Soc. Edin.*, vol. xl. part iii., 1903.

‡ Where the number permitted more than one skull to be measured, the mean of the group is given in the Table.

in Thug No. 130, with the retreating forehead, was 2·6, whilst in No. 131, in which the forehead was more highly arched, the proportion of base line was 2·7.

ADDENDUM, 29th June.—Since this memoir was read, Professor CUNNINGHAM has called my attention to the skeleton of a Tamil Sudra from Mysore, which was presented to him for the Museum early in June, by Mr R. B. THOMSON, M.B. It had been brought from Madras by an Indian student from the College of Medicine in that city.

The skeleton was a male, in which the ossification was completed, though the wisdom teeth had not erupted. The skull was elongated, ovoid, dolichocephalic, Ceph. Ix. 71. The glabella and supraorbitals were well marked, the nasion was depressed, the sutures were unossified, the pterion was normal, and the muscular ridges and processes were distinct. A special feature was the large interparietal bone which took the place of the occipital squama above the inion and superior curved lines. The occipital condyls were deeply cleft at the inner border; the posterior condylar foramina were absent; a pair of stunted processes projected downwards from the basi-occipital immediately in front of the basion. The basi-bregmatic diameter exceeded the greatest breadth, and the vertical index was 73·7. The upper jaw was orthognathic, 95. The complete facial index, 94·5, and the maxillo-facial index, 51·1, were leptoprosopic. The bridge of the nose was moderate, the nasio-malar index being 109; the nasal index, 49·9, was mesorhine. The orbital index was microseme, and the palato-maxillary index was hyperbrachyuranic.

The pelvis had distinct male characters. The iliac bones were expanded and the fossæ were translucent; the tubercle on the crest and the muscular ridges were moderate; the præauricular sulcus was a shallow groove. The cotyloid notch was wide, the pectineal crest and pubic spine were moderate. The body and neural arch of the first sacral vertebra were not fused with the second. The neural arches of the 2nd, 3rd, and 4th sacrals formed a continuous plate. The first coccygeal vertebra was fused with the body of the 5th sacral, and in each of these bones the cornua were strong though not continuous with each other. The following measurements were taken:

*Measurements of Pelvis.*

|   | mm.   |
|---|-------|
| Height of pelvis, . . . . .                       | 244   |
| Breadth " . . . . .                               | 196   |
| Breadth-Height Index, . . . . .                   | 79    |
| Between anterior superior iliac spines, . . . . . | 218   |
| " posterior " " " . . . . .                       | 71    |
| " outer borders of ischial tubera, . . . . .      | 136   |
| Vertical diameter of obturator foramen, . . . . . | 49    |
| Transverse " " " . . . . .                        | 34    |
| Obturator Index, . . . . .                        | 62·4  |
| Subpubic angle, . . . . .                         | 67    |
| Transverse diameter of pelvic brim, . . . . .     | 106   |
| Conjugate " " . . . . .                           | 102   |
| Pelvic or Brim Index, . . . . .                   | 96    |
| Length of sacrum, . . . . .                       | 101   |
| Breadth " . . . . .                               | 102   |
| Sacral Index, . . . . .                           | 100·9 |

The pelvis was broad in relation to the height, and the corresponding index was low. The sides of the pelvic brim were smooth, and as the conjugate diameter was high in relation to the transverse, the brim index, 96, was dolichopellic. The length of the sacrum did not include the body of the first coccygeal vertebra, and the index, 100·9, was platyhieric. The obturator index, 69·4, was intermediate between that in the Bagada and Veddah pelvises.

*Spinal Column.*—The vertebral formula was  $C_7 D_{12} L_{5}$ . The spine of the 6th cervical was almost as prominent as that of the 7th; the spines of the 3rd, 4th, and 5th were bifid. The 9th dorsal had only a half costal facet on each side of the body, and the 10th, 11th, and 12th had each a whole facet; the 10th had no costal facet on the transverse process; the 11th and 12th had each three tubercles and no long transverse process. The lumbar were normal. The diameters of the bodies of the lower dorsals and lumbar were as follows:—

|                  | A. V. D.      | P. V. D.      | Index.      |                  |
|------------------|---------------|---------------|-------------|------------------|
| 9th Dorsal V., . | 20 mm.        | 20 mm.        | 100         | } Special Index. |
| 10th „ „ .       | 20 „          | 21 „          | 105         |                  |
| 11th „ „ .       | 26 „          | 22 „          | 110         |                  |
| 12th „ „ .       | 21 „          | 24 „          | 114·3       |                  |
|                  | <hr/> 81 mm.  | <hr/> 87 mm.  | <hr/> 107·4 | General Index    |
| 1st Lumbar V.,   | 26 mm.        | 23 mm.        | 88·4        | } Special Index. |
| 2nd „ „          | 23 „          | 24 „          | 104·3       |                  |
| 3rd „ „          | 23 „          | 24 „          | 104·3       |                  |
| 4th „ „          | 23 „          | 24 „          | 104·3       |                  |
| 5th „ „          | 25 „          | 22 „          | 88          |                  |
|                  | <hr/> 120 mm. | <hr/> 117 mm. | <hr/> 97·5  | General Index    |

The indices of the bodies of the 9th, 10th, and 11th dorsal vertebrae showed that the upper and lower surfaces were almost parallel, but in the 12th the posterior vertical diameter was definitely higher than the anterior. The 1st lumbar presented the unusual character of the anterior vertical diameter, being distinctly higher than the posterior; in the 2nd, 3rd, and 4th it was slightly less; but in the 5th, as is customary, the anterior exceeded the posterior. The bodies of the 1st and 5th therefore in this spine contributed to produce an anterior lumbar convexity, or a kurtorachic spine.

The *Ribs* were twelve pairs. The *Sternum* articulated with twelve pairs of costal cartilages; the xiphi-sternum was ossified and fused with the meso-sternum, the manubrium was free, and not quite symmetrical on the two lateral borders.

*The Upper Limb.*—The *Clavicles* were slender and not strongly curved. The *Scapulae* had wide, shallow, coracoid notches; the axillary border was somewhat concave; the length was 144 mm., the breadth 102 mm., and the scapular index was 70·8. The *bones of the Shaft* had no special features, and the muscular markings were moderate.

Their length was as follows :

|  |         |
|--|---------|
| Humerus, from head to tip of trochlea, | 311 mm. |
| Radius, to tip of styloid,             | 249 "   |
| "    to base    "                      | 243 "   |
| Ulna, to tip of styloid,               | 265 "   |
| "    to base    "                      | 261 "   |

The radio-humeral index was 80, dolichokerkic, and the forearm was long in relation to the length of the upper arm.

*Shaft of Lower Limb.*—In the *Femur* the extensor area on the head was slightly prolonged on to the upper part and front of the neck, the anterior intertrochanteric line was rough and broad; there was no infratrochanteric ridge.\* The transverse diameter of the shaft of the femur a little below the small trochanter was 29 mm.; the antero-posterior diameter was 23 mm., and the index was 79.3; the shaft of the femur was not flattened in the upper third. The linea aspera was moderate. The inner condyl behind was prolonged a little higher than the edge of the intercondylar fossa.

The *Tibia* was somewhat retroverted at the head, the inner condylar surface was concave, the outer convexo-concave. The shaft was compressed laterally, the antero-posterior diameter was 33 mm., and the transverse 23 mm.; the index of platyknemia was 69.

The *Fibula* showed moderate muscular markings. The bones of the shaft measured as follows :—

|   | Right.  | Left.   |
|---|---------|---------|
| Femur, maximum length,                            | 443 mm. | 443 mm. |
| "    oblique length,                              | 439 "   | 441 "   |
| Tibia, from condylar surface to tip of malleolus, | 359 "   | 350 "   |
| "    "    "    astragular surface.                | 352 "   | 345 "   |
| Fibula, maximum length,                           | 358 "   | 356 "   |

The stature calculated from the length of the femur and tibia was probably about 5 feet 3 inches. The right tibio-femoral index was 80, the left 78, and the index was brachyknemic. The relative length of the upper arm and thigh, as expressed by the femoro-humeral index, was 70. The intermembral index was also 70.

\* See my address on some Distinctive Characters of Human Structure at the Toronto meeting of the British Association, *Reports*, p. 775, *c.s.*, 1897, for an explanation of the signification of these characters.



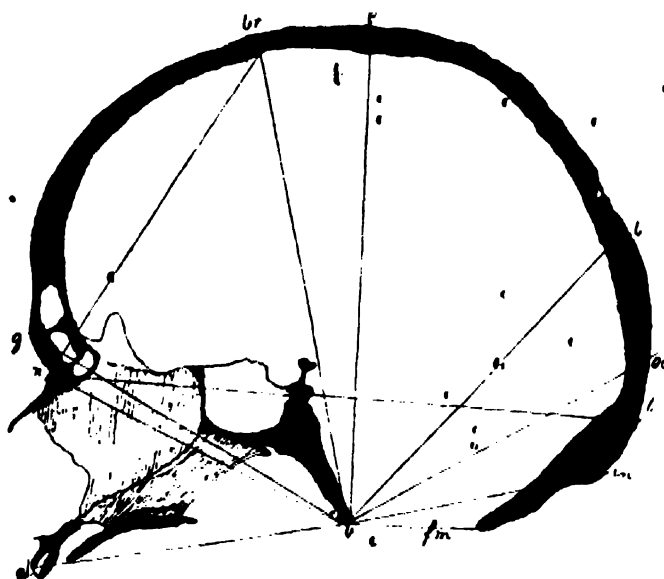


FIG. 61.—Sagittal section through skull of Tamil Sudra.  
Table I, K.

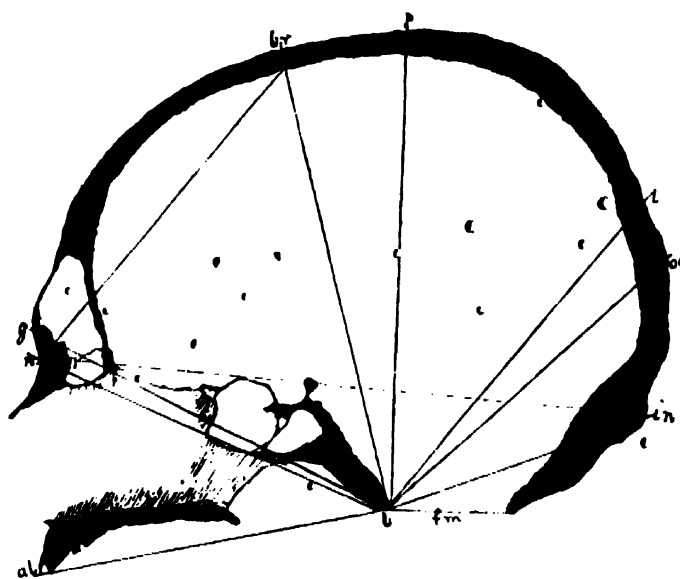


FIG. 62.—Sagittal section through skull of Thug, No. 130.  
Table III.

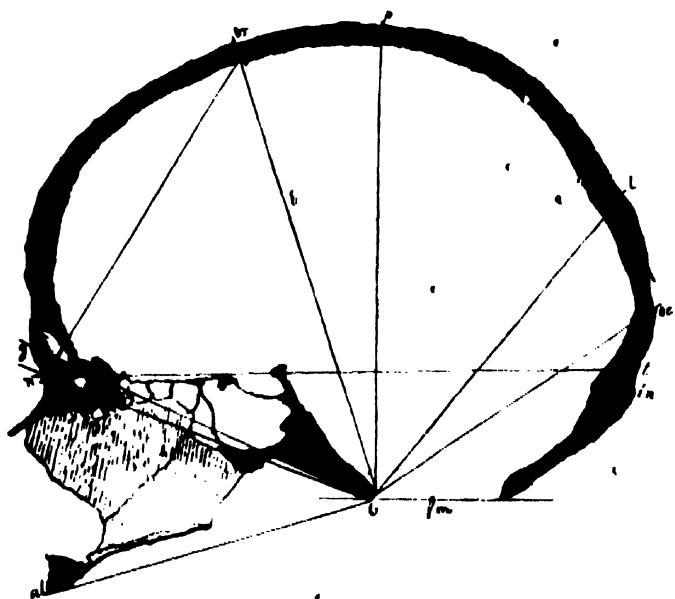


FIG. 63.—Sagittal section through skull of Thug, No. 131.  
Table III.

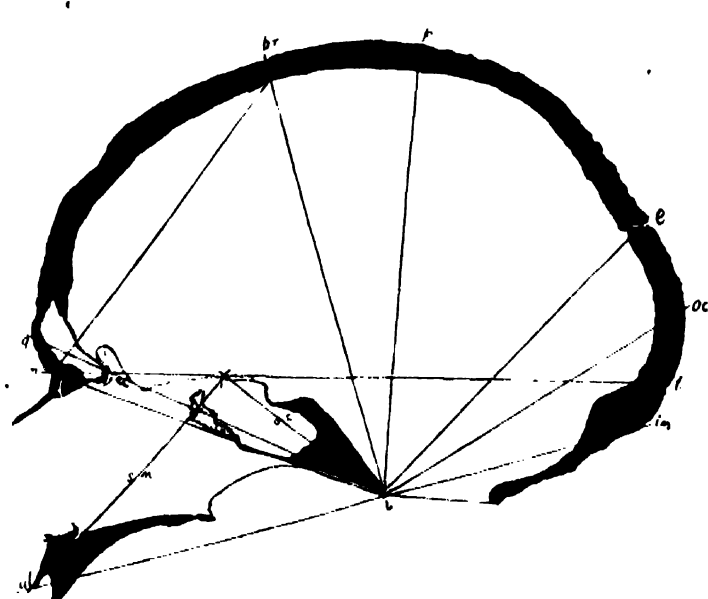


FIG. 64.—Sagittal section through skull of Veddah.  
Part II., Table IX., Pl. VI. figs. 27, 28, metopic.

*b.br.* Basi-bregmatic radius.  
*b.p.* „ perpendicular radius.  
*b.l.* „ lambdal „  
*b.oc.* „ occipital „  
*b.in.* „ inial „  
*b.gl.* „ glabellar „  
*b.n.* „ nasal radius.  
*b.al.* „ alveolar radius.

*n.br.* Nasio-bregmatic chord.  
*n.t.* „ tentorial plane.  
*f.m.* Plane of foramen magnum.  
*o.s.* Basi-occipito-sphenoid axis, 56 mm.  
*s.m.* Spheno-maxillary line, 79 mm.  
 Spheno-maxillary angle, 95°.  
 Spheno-ethmoid angle, 144°.

## EXPLANATION OF PLATES VIII.-XI. :

The Plates and Figures are numbered in sequence with those of Part II. of this series of Memoirs.  
 The Photographs of the skulls from which the process blocks were produced were taken under my  
 • superintendence by Mr John Henderson, Assistant Keeper of the Anatomical Museum.

## PLATE VIII.

- FIG. 37. Tamil Sudra, Trichinopoly, profile. Table I., K.  
 „ 38. The Same, full face.  
 „ 39. The Same, vertex.  
 „ 40. Pariah, Madras, profile. Table II., 48A.  
 „ 41. The Same, full face.  
 „ 42. The Same, vertex.

## PLATE IX.

- FIG. 43. Badaga, Nilgiris, profile. Table II.  
 „ 44. The Same, full face.  
 „ 45. The Same, vertex.  
 „ 46. Lhasa, Tibet, profile. Table V.  
 „ 47. The Same, full face.  
 „ 48. The Same, vertex.

## PLATE X.

- FIG. 49. Kham, Eastern Tibet, profile. Table V.  
 „ 50. The Same, full face.  
 „ 51. The Same, vertex.  
 „ 52. Chin Hills, vertex. Part I., Table I., B, Pl. I  
 „ 53. Upper Burma, vertex. Part I., Table VI., Pl. III.  
 „ 54. Thug, profile. Table III., No. 122, Gunga Bishun.

## PLATE XI.

- FIG. 55. Seistan, A, profile. Table V.  
 „ 56. The Same, full face.  
 „ 57. The Same, vertex.  
 „ 58. Seistan, C, profile. Table V  
 „ 59. The Same, full face.  
 „ 60. The Same, vertex.



SIR WILLIAM TURNER ON "Crania of People of India, Part III. PLATE VIII.

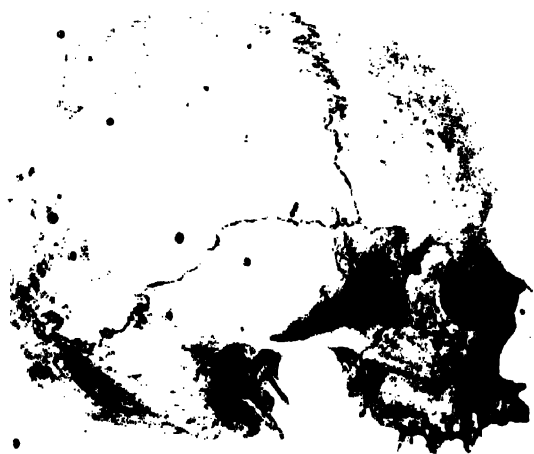


FIG. 37. — Tamil Sudra.

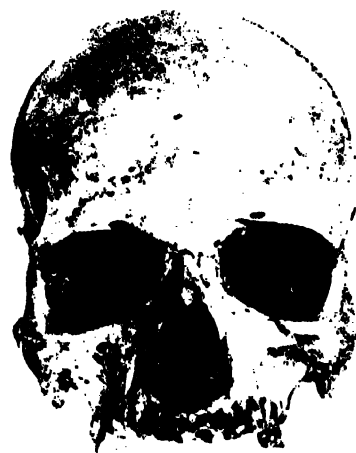


FIG. 38. — Tamil Sudra.



FIG. 39. — Tamil Sudra.



FIG. 40. — Pariah.



FIG. 41. — Pariah.

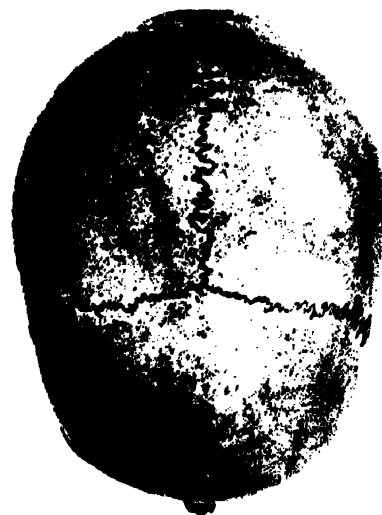


FIG. 42. — Pariah.



SIR WILLIAM TURNER ON "Craniology of People of India," Part III.—PLATE IX.



FIG. 43.—Badaga.



FIG. 44. Badaga.

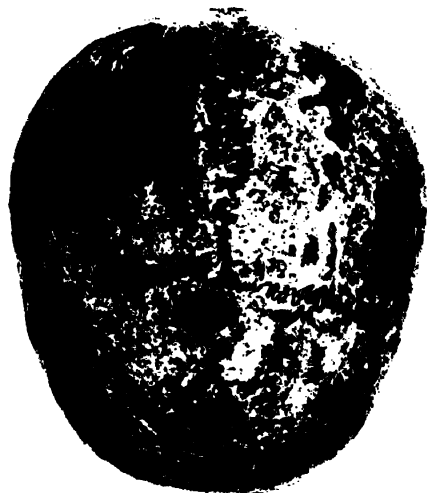


FIG. 45 --Badaga.

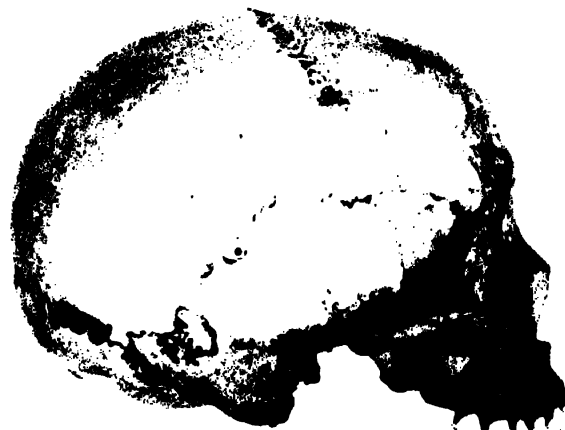


FIG. 46. —Lhas



FIG. 47. —Lha



FIG. 48.—Lhasa.



SIR WILLIAM TURNER on "Craniology of People of India," Part III.—PLATE X.



FIG. 49.—Kham



FIG. 50. Kham

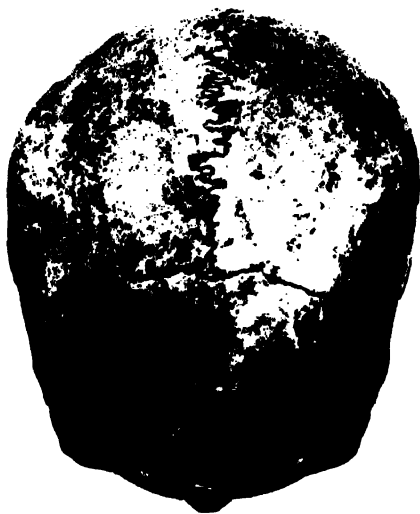


FIG. 51. Kham



FIG. 52. Chin, B.



FIG. 53.—Upper Burma.

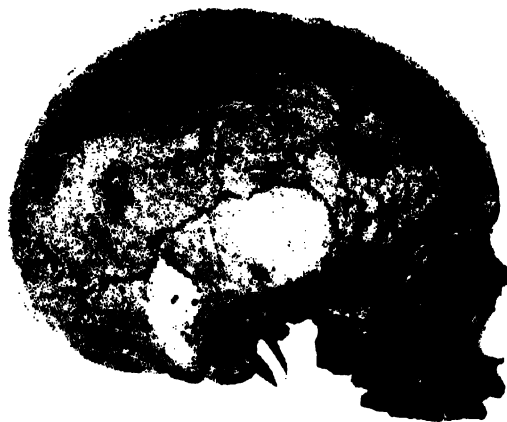


FIG. 54.—Thug.





SIR WILLIAM TURNER ON "Craniaology of People of India," Part III.—PLATE XI.

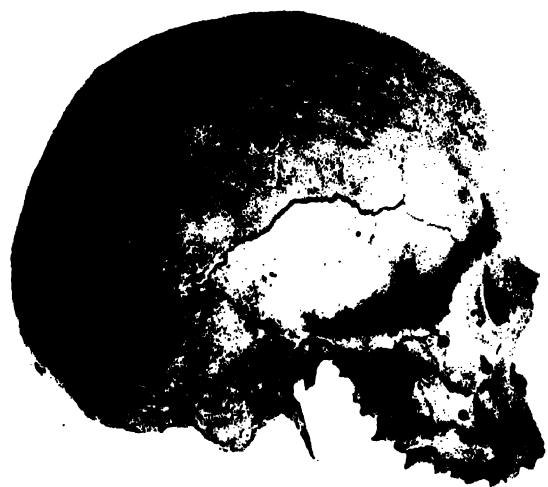


FIG. 55. Seistan, A.



FIG. 56. Seistan, A.



FIG. 57. —Seistan, A.

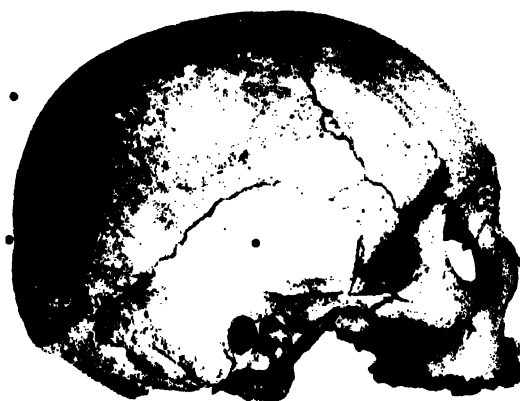


FIG. 58. —Seistan, C.



FIG. 59. — Seistan, C.



FIG. 60. — Seistan, C.



TRANSACTIONS  
OF THE  
ROYAL SOCIETY OF EDINBURGH.

VOL. XLIX.—PART III.—(No. 13).

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CONTRIBUTIONS TO THE CRANIOLOGY OF THE  
PEOPLE OF THE EMPIRE OF INDIA.

PART IV.: BHILS, FRONTIER TRIBES OF BURMA, PAKÒKKU  
TRIBES, SOUTH SHAN TRIBES, TIBETANS.

BY

PRINCIPAL SIR WILLIAM TURNER, K.C.B., D.C.L., F.R.S.

[WITH THREE PLATES AND FIGURES IN TEXT.]

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MDCCCXIII.

*Price Three Shillings and Threepence.*



**XIII.—Contributions to the Craniology of the People of the Empire of India.—Part IV.: Bhils, Frontier Tribes of Burma, Pakôkku Tribes, South Shan Tribes, Tibetans. By Principal Sir William Turner, K.C.B., D.C.L., F.R.S., President of the Society, Knight of the Royal Prussian Order Pour le Mérite. (With Three Plates and Figures in Text.)**

•(Read June 2, 1913. MS. received July 7, 1913. Issued separately October 17, 1913.)

**PART IV.**

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**INTRODUCTION. •**

In continuation of my studies on the Craniology of the people of the Empire of India, of which three parts have already been published in the *Transactions* of the Society, I propose in Part IV. to give an account of the Bhils, a wild tribe occupying the jungle in some districts of Central India; also skulls of some of the frontier tribes of Burma from the Chin Hills to the South Shan States, with some supplementary observations on the skulls of Tibetans. The skulls are preserved in the Anatomical Museum of the University of Edinburgh.

**BHILS. TABLE I. (Plate XII.)**

The Bhils or Bheels are a pre-Aryan, Dravidian people of Central India, inhabiting the Vindhya, Satpurā, and Ajanta Hills, and distributed through Maiwar, Malwa, Khāndesh, and Gujarat. The total numbers were stated in the Census of 1901 as 206,934. The men who live in the hills wear only a loin-cloth, with a whisp round the head, but the women are better clothed. Both sexes, when dwelling in the plains, are often Hinduised and are clothed like their neighbours the Hindus. Their food consists largely of jungle roots, fruits, vermin, and common grains, though deer, sheep, fowls and fish are also eaten. Surgeon HENDLEY described\* the Bhils of Maiwār as having almost black skins; hair black, straight, thick, long; face smooth, moustache slight, beard scanty; eyes large, dark, prominent, palpebral fissure small; nose broad, sunk at the

\* *Journ. Asiatic Soc. Bengal*, 1875, part 1, p. 347, vol. xliv.

bridge, nostrils dilated, clubbed at the tip; mouth large, lips thick, jaw orthognathic; zygoma large and salient; malar bones flat and prominent; cheeks full. C. J. MALCOLM stated\* that, though light and spare in limbs and body, they were very active and capable of undergoing great fatigue. The fullest account of the customs of the Bhils has been given by Captain C. E. LUARD, Superintendent of Ethnography,† from which it appears that Bhils cannot marry outside the tribe, though in the septs into which the tribe is divided marriage is exogamous as regards the sept; infant marriage is not practised, and the remarriage of widows is permitted. They worship the powers of nature, and each village has its tutelary deity: they all reverence the Ber tree (*Zizyphus jujuba*).

There is a difference of statement as to stature. HENDLEY gave the mean of 128 men as 5 feet 6 inches. MALCOLM spoke of them as of short stature, active, and when well fed equal in height to a Hindu. LUARD stated that they were of low stature, the average height of the men being 5 feet 2 inches. Tattooing is common with both sexes. The characteristic weapon is the bow, and the name Bhil is said to be derived from the Dravidian word for a bow. The dead are cremated and the ashes are thrown into a neighbouring river. The burning of the dead throws difficulty in the way of obtaining the skulls of this Dravidian tribe.

In July 1908 Lieut.-Colonel Sir JAMES R. ROBERTS, I.M.S., then Residency Surgeon at Indore, presented me with six skulls collected in the Alirajpore State, where the Bhils are numerous. They were obtained in the vicinity of a camp where the Bhils had been gathered together during the famine of 1890 and where many had died. Three skulls were apparently males and three females (Table I.); four were adults (Nos. 7, 8, 9, 10); in a fifth (11) the permanent molars had erupted but the basi-cranial synchondrosis was not ossified; whilst in a sixth (12) the synchondrosis was not ossified and the wisdoms were not erupted. The lower jaw had been preserved in only one skull (10), and in another (8) the facial bones were missing.

*Norma verticalis*.—The skulls were moderate in size and of dolichocephalic proportions. The cranial outline was ovoid, but in No. 8 the parietal eminences were so prominent that the skull had a pentagonal outline. The vault was slightly raised in the sagittal region, but was not keeled, neither was the suture depressed below the plane of the parietals. The slope from the suture to the eminences was moderately steep, but in No. 12 the transverse arc of the vault was flattened. The side walls of the crania did not bulge, and the greatest parieto-squamous breadth, except in No. 7, was at or near the eminences. The suprainial squama was moderately convex, especially in the females, but in No. 7 the inion formed the occipital pole of the cranium and the squama sloped upwards and forwards. The postparietal region sloped gently downwards to the lambdoid suture. With one exception the skulls were cryptozygous.

\* *Trans. Roy. Asiatic Soc.*, 1. 88.

† *Census of India*, p. 162, 1901; and more fully in the *Ethnographical Survey of the Central India Agency*, Monograph No. 2, "Jungle Tribes of Malwa," Lucknow, 1909, with numerous plates.

TABLE I.—*Bhils*.  
Group XXI., Subgroup B.\*

| Collection number                  | 7     | 8     | 9     | 10    | 11       | 12       |
|------------------------------------|-------|-------|-------|-------|----------|----------|
| Age                                | Ad.   | Ad.   | Ad.   | Ad.   | Adolesc. | Adolesc. |
| Sex                                | M.    | M.    | M.    | F.    | F.       | F.       |
| Cubic capacity                     | 1250  | 940   | 1200  | 1080  | 1200     | 1210     |
| Glabello-occipital length          | 175   | 166   | 175   | 173   | 174      | 175      |
| Basi-bregmatic height              | 130   | 120   | 128   | 124   | 130      | 117      |
| Vertical Index                     | 74.3  | 72.3  | 73.1  | 71.7  | 74.7     | 66.9     |
| Minimum frontal diameter           | 87    | 80    | 94    | 83    | 84       | 84       |
| Stephanic diameter                 | 106   | 84    | 110   | 91    | 99       | 98       |
| Asterionic diameter                | 105   | 96    | 103   | 96    | 96       | 103      |
| Greatest parieto-squamous breadth  | 131s. | 120p. | 131p. | 123p. | 126p.    | 126p.    |
| Cephalic Index                     | 74.9  | 72.3  | 74.9  | 71.1  | 72.4     | 72.      |
| Horizontal circumference           | 490   | 452   | 498   | 479   | 487      | 488      |
| Frontal longitudinal arc           | 119   | 115   | 114   | 121   | 127      | 128      |
| Parietal                           | 128   | 116   | 118   | 113   | 125      | 119      |
| Occipital                          | 114   | 100   | 107   | 113   | 105      | 105      |
| Total                              | 361   | 331   | 339   | 347   | 357      | 352      |
| Vertical transverse arc            | 293   | 262   | 276   | 276   | 289      | 283      |
| Basal transverse diameter          | 112   | 107   | 113   | 102   | 109      | 112      |
| Vertical transverse circumference  | 405   | 369   | 389   | 378   | 398      | 395      |
| Length of foramen magnum           | 35    | 32    | 35    | 35    | 36       | 35       |
| Basi-nasal length                  | 96    | 96    | 104   | 98    | 93       | 97       |
| Basi-alveolar length               | 93    | ...   | 100   | 98    | 93       | 97       |
| Gnathic Index                      | 96.9  | ...   | 96.2  | 100.  | 100.     | 100.     |
| Total longitudinal circumference   | 492   | 459   | 478   | 480   | 486      | 484      |
| Interzygomatic breadth             | ...   | ...   | 124   | ...   | 112      | 117      |
| Intermalar breadth                 | ...   | ...   | 113   | 103   | 101      | 104      |
| Nasio-mental length                | ...   | ...   | ...   | 104   | ...      | ...      |
| Nasio-mental complete facial Index | ...   | ...   | ...   | ...   | ...      | ...      |
| Nasio-alveolar length              | 63    | ...   | 66    | 55    | 65       | 63       |
| Maxillo-facial Index               | ...   | ...   | 53.2  | ...   | 58.      | 53.8     |
| Nasal height                       | 46    | ...   | 52    | 43    | 49       | 46       |
| Nasal width                        | 27    | ...   | 23    | 23    | 26       | 21       |
| Nasal Index                        | 58.7  | ...   | 44.2  | 53.5  | 53.1     | 45.7     |
| Orbital width                      | 37    | ...   | 43    | 36    | 34       | 32       |
| Orbital height                     | 32    | ...   | 36    | 32    | 35       | 34       |
| Orbital Index                      | 86.5  | ...   | 83.7  | 88.9  | 102.9    | 106.     |
| Palato-maxillary length            | 55    | ...   | 54    | 52    | 51       | 54       |
| Palato-maxillary breadth           | 60    | ...   | 63    | 54    | 58       | 59       |
| Palato-maxillary Index             | 109.  | ...   | 116.6 | 103.8 | 113.7    | 109.2    |
| Nasio-malar Index                  | ...   | ...   | 108.8 | 108.8 | 109.3    | 110.5    |
| Cranio-facial Index                | ...   | ...   | 70.8  | ...   | 64.3     | 66.8     |
| Lower jaw. { Symphysial height     | ...   | ...   | ...   | 29ap. | ...      | ...      |
| Coronoid                           | ...   | ...   | ...   | 62    | ...      | ...      |
| Condylod                           | ...   | ...   | ...   | 66    | ...      | ...      |
| Gonio-symphysial length            | ...   | ...   | ...   | 82    | ...      | ...      |
| Inter-gonial width                 | ...   | ...   | ...   | 87    | ...      | ...      |
| Breadth of ascending ramus         | ...   | ...   | ...   | 32    | ...      | ...      |

*Norma lateralis*.—In the males the lower or facial forehead receded a little, and the glabella and superciliary ridges were moderate. In the females the facial forehead approached the vertical, and the glabella and ridges were feeble. In both sexes the superciliary ridge was differentiated from the supraorbital border by the notch or

\* The groups and subgroups are the arrangement in the Catalogue of Crania in the Anatomical Museum.



foramen, and the torus supraorbitalis was not formed; a transverse supraorbital depression was slightly indicated in the males. The supraorbital trigone was fairly marked in the males. The frontal eminences, with one exception, were distinct; no skull was metopic. The nasion was depressed in one skull only. The nasal bones were not projecting; the bridge was slightly keeled and its profile outline was somewhat concave; when entire their length in a straight line measured 17, 21, 23 mm. respectively. The interorbital width was 20, 21, 22, 23, 24 mm. respectively. The skulls rested behind on a convex cerebellar part of the occipital. In four crania the occipital longitudinal arc was the shortest, in one it and the parietal arc were equal; in three the frontal arc was the longest, in three the parietal was the longest.

*Norma facialis.*—The lateral boundary of the anterior nares was a sharp ridge, the *crista prænasalis* (KLAATSCH),\* which gradually blended with the incisive region, though in one female it separated the nasal floor from the incisive region. Immediately behind it in the males was a narrow, shallow groove, the *fossa prænasalis*, bounded behind on the wall of the inferior meatus by a faint ridge (*margo infranasalis*) which crossed the nasal floor to join the low maxillo-nasal spine. In one skull (No. 12) the incisive region showed alveolar prognathism. In three skulls the canine fossæ were deep. The width of the anterior nares ranged from 21 to 27 mm., the mean of two males was 25 mm., and of three females 23.3 mm.; the nasal height ranged from 43 to 52 mm., the mean of two males was 49 mm., and of three females 46 mm. In two skulls the nasal index was leptorhine, in three platyrhine, and the mean index, 51, was mesorhine. The orbital borders were not thickened and the aperture was rounded in two skulls, the mean index, 43.6, was megaseme, though two were mesoseme. The gnathic index, 98.6, computed by FLOWER'S method, was mesognathous in the mean, though two were orthognathous.

The imperfect facial region did not permit a complete facial index to be taken, but the maxillo-facial index, ranging in three specimens from 53.2 to 58, with 55 as the mean, was leptoprosopic, narrow in relation to height, which was also their character individually. The nasio-malar index, as determined by the relation of the bimalar to the nasio-malar diameter,† ranged from 108.8 to 110.5; one was pro-opic, with a fair nasal profile, three were mesopic, but in no specimen was the profile flat-faced, platy-opic. In three skulls the palate was highly arched, and in two moderately so; the palato-maxillary index ranged from 103.8 to 116.6, three were dolichuranic, one mesuranic, one brachyuranic. The only lower jaw was of moderate size, the angle was everted and the chin was oblique and prominent. The teeth were mostly lost, those in place were partially worn.

The cranial sutures were well denticulated. Small Wormian bones were seen in the lambdoid of No. 8, in the squamous of No. 12, and in the occipito-mastoid of

\* *Reports of Pathological Laboratory of Lunacy Department*, vol. i., part iii., 1908, Sydney.

† The nasio-malar index is obtained by the formula  $\frac{\text{nasio-malar di.} \times 100}{\text{bimalar di.}}$ . Index below 106 is *platyopic*, flat-faced profile; *pro-opic*, projecting profile, above 110; *mesopic*, between 106 and 110.

No. 11. Nos. 8 and 9 had each a left epipteric, in No. 12 the parieto-ali-sphenoid suture was very broad. No skull had a third condyl nor complete pterygo-spinous plate, though in No. 11 the right external pterygoid was broader than usual. The mastoids, inion, and curved lines were feeble. No. 12 had a stunted paracondyloid process, and in it a rudimentary proatlas subjacent to the occipital bone was represented by an imperfect neural arch ossified to the right half of the foramen magnum. The occipital condyles were flattened, and each was partially crossed by a groove on the surface. The linea superior (*torus occipitalis transversus*) in the male skulls was differentiated from the inion and the superior curved line, but in the female the separation was indistinct. The occipital crest and inferior curved line were well marked in both sexes, and the *processus retromastoideus*\* was distinct. In three skulls the *tuberculum supra-mastoideum anterius* was a definite elevation.

The glabello-occipital diameter ranged from 166 to 175 mm., and the mean was 173 mm.; the greatest breadth ranged from 120 to 131 mm., the mean being 126.1 mm.; the cephalic index ranged from 71.1 to 74.9, and the mean was 72.9, dolichocephalic. The basi-bregmatic height ranged from 117 to 130 mm., with the mean 124.8 mm.; in three skulls the height was less than the breadth, in two greater, in one they were equal; in the series the mean breadth, 126.1, was a little more than the mean height, 124.8 mm.; the vertical index ranged from 66.9 to 74.7, the mean was 72.1, metriocephalic.† The breadth-height index‡ ranged from 92.8 to 100.7, and the mean was 98. The cranio-facial index§ gave the relation of the length of the cranium to the interzygomatic breadth of the face. In three skulls it ranged from 64.3 to 70.8, with a mean 67.3; in each this index was distinctly less than the cephalic index, and the face was narrower in relation to the length of the cranium than was the breadth to the length of the cranium.

#### COMPARISON WITH SKULLS OF OTHER DRAVIDIAN TRIBES.

(Figures, pages 716, 717.)

In previous craniological memoirs I have estimated the proportion which the *base-line* of the skull, defined by Professor CLELAND as the basi-nasal diameter conjoined with the antero-posterior diameter of the foramen magnum, bears to the total longitudinal circumference of the skull, as well as to the total longitudinal arc.|| I have computed these proportions in the Bhil skulls, and in such typical dolichocephalic Dravidians as the Gonds, Kols, Múndas, Bhuiyá, Oraons, and Tamil Sudras—tribes in which I was

\* See Professor WALDEYER'S memoir, *Der processus retromastoideus*, etc., Berlin, 1909, and my memoir on the Skeleton of the Aborigines of Tasmania, *Trans. Roy. Soc. Edin.*, vol. xlvii. p. 413, pl. i. fig. 4, 1910.

† See my memoir, "Craniology of People of Scotland," *Trans. Roy. Soc. Edin.*, vol. xl., part iii., 1903.

‡  $\frac{\text{Basi-bregmatic height} \times 100}{\text{Parieto-squamous breadth}} = \text{breadth-height index.}$

§  $\frac{\text{Interzygomatic breadth} \times 100}{\text{Maximum length}} = \text{cranio-facial index.}$

|| Partially in *Challenger Report, Zoology*, part xxix., 1884. More fully in *Trans. Roy. Soc. Edin.*, vol. xlv., p. 304, 1906, and p. 817, 1907; vol. xlvii. p. 399, 1908; vol. xlvii. p. 419, 1910. In the memoir on the natives of Madras, 1906, I compared these measurements and proportions with those obtained from the crania of several other races.



facial indices is not uniform. The cephalic indices varied in the collective groups from 3·8 to 7·1, with a mean range of 5·5, whilst the vertical indices, which varied from 2·6 to 9·1, had a mean range of 5·3, so that the mean proportionate length of the cranium to its breadth was almost the same as to its height. The gnathic indices, obtained by FLOWER'S method, varied from 0·7 to 8·5, with a mean range of 5·47. On the other hand, the other indices showed a much wider extent of variation in the groups. The nasal index ranged from 0·2 to 14·5, with a mean 9·4; the orbital index from 2·7 to 25·3, with a mean 12·7; the palato-maxillary index from 6·2 to 25, with a mean 16·8.

It should be stated that the thirty-nine Dravidian skulls, from which the mean indices were computed in the Table, with eight exceptions, had the cephalic index below 75, that in six of these this index ranged from 75 to 75·6, in one was 76·6, in one 77·1. The Dravidian skull therefore was dolichocephalic, as defined by its conventional numerical limit, and when in the few exceptional cases it was 75 or a little higher, the excess was mostly fractional, and below not only the brachycephalic but also the upper range of the mesocephalic standard. The vertical index in the groups was either hypsicephalic, high skulls, 75·1 and upwards; or metriocephalic,\* moderately high skulls, 70·1 to 75; in only two skulls was the index chamacephalic, low skulls, index below 70. In the gnathic index, which expresses more or less precisely the projection of the front of the upper jaw, the skulls were either orthognathous, index below 98; or mesognathous, index from 98 to 103; only one skull was prognathous, index 104·4.

Of the other more variable indices the nasal had the smallest range. It fluctuated between 43·8 and 58·9. Fourteen skulls were platyrrhine, fourteen were mesorrhine, seven only were leptorrhine. The orbital index ranged from 71·8 to 106, but twenty-five had low microseme orbits, six had orbits of moderate height, mesoseme, whilst in eight the orbits were high and rounded in outline, or megaseme. The palato-maxillary diameters furnished five with dolichuranic indices, five with mesuranic, and fourteen with brachy- or hyperbrachyuranic indices.

In regard to the range of variation in the respective indices, the analysis of the Dravidians shows that in these dolichocephalic skulls the indices, based on the proportions between the length, breadth, and height of the cranium, have a much less range than those in which the measurements embraced either partially or wholly the facial bones. In this respect the analysis corresponded generally with the results recorded in my *Challenger Report* already referred to. As regards the orbital and nasal indices, PAUL BROCA many years ago † had recognised this character and had dwelt on the perturbing influence of the individual variations in the nasal index. The greater constancy of the cephalic and vertical indices, and of the gnathic index also, though the last is sometimes more variable, justified the value which ANDERS RETZIUS recognised when

\* For the reasons given in my previous memoirs I use the term metriocephalic, expressing moderate relative height, in preference to that of orthocephalic employed by many craniologists.

† *Revue d'Anthropologie*, 1875 and 1876.

he gave them so important a position in his system of classification, based on the characters of the skull in the various races of men.

Of the thirty-nine skulls included in this analysis, twenty-five were apparently males and fourteen females. The cranial capacity of the males ranged from 940 cubic centimetres in a Bhil to 1470 c.c. in a Kol, and the mean of the series was 1287 c.c. Five were upwards of 1400; seven were between 1300 and 1400; eleven were between 1200 and 1300; one between 1100 and 1200 and one between 900 and 1000 c.c. The cranial capacity of the females ranged from 980 to 1305 c.c. and the mean of the series was 1179 c.c. Only one female skull was as much as 1305 c.c., seven were between 1200 and 1300; three between 1100 and 1200; two from 1000 to 1100 and one below 1000 c.c. Variations in capacity were shown in the different tribes in both sexes, but the females, as is indeed customary, were distinctly less than the males, though, if I am correct in the apportionment of the skulls between the two sexes, each sex had a skull whose capacity was below 1000 c.c. It is, however, noteworthy that the highest capacity in the female series was only 1305 c.c.

#### SAGITTAL CONTOURS.

(Figures, pages 716, 717.)

The late Mr GEORGE BUSK published fifty-one years ago\* a memoir on "Cranio-metry and Craniography," in which he criticised the cranial measurements proposed by VON BAER in the Göttingen Anthropological Report.† He showed the importance *inter alia* of making measurements to radiate from a definite fixed point to the surface of the skull, so as to afford sufficient data for estimating the relative proportions of the different divisions of the cranium. BUSK selected as the fixed point for these measurements the centre of the external auditory meatus, from which radiating lines were drawn to certain points on the surface. He devised and figured a craniometer with a pair of movable plugs, one of which could be inserted into each meatus, and could be employed to measure heads as well as crania. Dr BARNARD DAVIS used similar radial measurements in the compilation of his Catalogues of Crania.‡ Professor HUXLEY pointed out§ the advisability of bisecting skulls longitudinally and vertically in or near the mesial plane, and he drew and measured lines from more than one point on the base to points on the cranial vault. Professor CLELAND emphasised|| the importance of radial measurements and selected the postauricular depression in preference to the meatus as the point from which the radii should be drawn.

In my *Challenger Report*¶ I published longitudinal mesial sections through a number of the skulls, and recorded lines and measurements radiating from the basion to definite points in the mesial line of the surface of the skull. I also erected from the

\* *Natural History Review*, October 1862.

† *Bericht ueber die Zusammenkunft einiger Anthropologen*, Leipzig, 1861.

‡ *Thesaurus Craniorum*, 1867; Supplement, 1875; also in *Crania Britannica*.

§ *Journ. Anat. and Phys.*, vol. i. p. 60.

|| "Variations of the Human Skull," *Trans. Roy. Soc.*, London, 1869.

¶ *Zool. Challenger Exp.*, part xxix., 1884.

anterior end of the plane of the foramen magnum a basi-perpendicular line which reached the vault of the cranium at a point behind the bregma. The radii which intersected the cerebral cavity were the basi-bregmatic, -perpendicular, -lambdal, and -occipital, whilst the basi-inial, -glabellar, -nasial, and -alveolar radii were below that part, and reached the inion, glabella, nasion, and alveolar points. The interval between the frontal pole of the cranial cavity and the basi-perpendicular radius corresponded approximately to the frontal lobe of the cerebrum; that between the basi-perpendicular and basi-lambdal to the parietal and upper part of the temporal, and that from the basi-lambdal to the attachment of the tentorium, to the occipital lobe of the cerebrum.

In my series of craniological memoirs which have appeared in the *Transactions*\* since 1901, I gave additional illustrations of these radial measurements, and in 1906 I figured a line *nt*, as the axis of the nasio-tentorial plane, and as dividing the cranial cavity into a supra-tentorial or cerebral part, and an infra-tentorial part for the lodgment of the cerebellum, pons, and medulla. After intersecting the nasio-tentorial diameter, the supra-tentorial radiating lines were called respectively tentorio-bregmatic, -perpendicular, -lambdal, and -occipital. Some craniologists have selected as in the approximately horizontal plane of division of the cranial cavity a *glabello-inial* diameter from the glabella to the inion, but for reasons, which I have stated elsewhere,† preference has been given to the *nasio-tentorial* diameter. To enable, however, a comparison to be made with measurements in which the glabello-inial diameter has been employed, its length has been measured and stated in Table V.

I have not bisected the skulls of the Bhils, but have obtained, by Lissauer's diagraph, tracings antero-posteriorly and mesially of their cranial contours, which reproduced the outline of the surface of the skull in this tribe. I have also studied the contour tracings of skulls of other Dravidian tribes, some of which were obtained with the diagraph, whilst others had been longitudinally and mesially bisected. In the latter, not only was the surface of the cranium displayed, but the varying thickness of the vault, and the length and height of the cranial cavity.

Table IV. has been constructed to show the radial and other measurements in several male skulls. In the case of the Bhil, Gond, and Tamil Sudra, where tracings of skulls in each tribe were obtained, the measurements for each of these skulls are given. In addition, tracings of single male skulls of Kol, Munda, Bhoomiz Santal, Turi, Pahariya, and Juang were measured and recorded. The crania were dolichocephalic, except that in the Pahariya the cephalic index was 76.7. The glabello-occipital length, parieto-squamous breadth, and collective height of four radii, tentorio-bregmatic, -perpendicular, -lambdal, and -occipital, are also included in the Table.

\* *Trans. Roy. Soc. Edin.*, vol. xlv. p. 302, 1906; also p. 816, 1907; vol. xlv. p. 396, 1908; vol. xlvii. p. 418, 1910.

† In my paper on *Pithecanthropus erectus*, *Journ. of Anat. and Phys.*, vol. xxix., 1895, I suggested the nasio-tentorial plane of section.

TABLE IV.—*Dravidian Tribes.*

|   | Bhils.<br>XXI. B. |      |      | Gonds.<br>XXI. B. |          |          | Kol. | Munda. | Turi. | Pahariya. | Bhoomiz<br>Santal. | Juang. | Tamil Sudra.<br>XXI. D. |           |
|---|-------------------|------|------|-------------------|----------|----------|------|--------|-------|-----------|--------------------|--------|-------------------------|-----------|
|   | 7.                | 8.   | 9.   | A.<br>1.          | B.<br>2. | D.<br>4. |      |        |       |           |                    |        | H.<br>8.                | K.<br>10. |
| Cephalic Index . . .  | 74.9              | 72.3 | 74.9 | 69.4              | 69.5     | 71.2     | 73.8 | 70.9   | 71.8  | 76.7      | 72.7               | 73.2   | 72.6                    | 74.3      |
| Basi-inial radius, <i>b.i.</i> .  | 83                | 66   | 70   | 71                | 86       | 70       | 78   | 78     | 86    | 79        | 80                 | 83     | 84                      | 76        |
| „ -occipital radius, <i>b.oc.</i> .   | 97                | 84   | 91   | 104               | 103      | 99       | 109  | 99     | 110   | 100       | 167                | 101    | 102                     | 100       |
| Basi-lambdal radius, <i>b.l.</i> .  | 111               | 100  | 104  | 110               | 115      | 119      | 122  | 119    | 120   | 108       | 113                | 122    | 108                     | 115       |
| „ -perpendicular radius, <i>b.p.</i> .  | 132               | 122  | 125  | 139               | 132      | 135      | 125  | 133    | 132   | 125       | 133                | 145    | 131                     | 143       |
| Basi-bregmatic radius, <i>b.br.</i> .   | 130               | 120  | 128  | 139               | 132      | 135      | 126  | 128    | 132   | 124       | 131                | 142    | 134                     | 141       |
| Basi-glabellar radius, <i>b.g.</i> .  | 102               | 98   | 108  | 113               | 97       | 104      | 110  | 111    | 110   | 102       | 103                | 111    | 111                     | 104       |
| „ -nasal radius, <i>b.n.</i> .  | 96                | 96   | 104  | 104               | 91       | 97       | 101  | 101    | 99    | 96        | 95                 | 106    | 103                     | 94        |
| „ -alveolar „ <i>b.al.</i> .  | 93                | ...  | 100  | 102               | 95       | 94       | 99   | 95     | 101   | 95        | 92                 | 103    | 97                      | 90        |
| Nasio-tentorial plane, diameter <i>n.t.</i> (TURNER) .                        | 175               | 155  | 167  | 170               | 168      | 163      | 176  | 171    | 177   | 169       | 175                | 171    | 175                     | 167       |
| Tentorio-bregmatic diameter . . .   | 93                | 93   | 93   | 96                | 97       | 102      | 88   | 88     | 96    | 93        | 96                 | 103    | 97                      | 97        |
| Tentorio-perpendicular diameter . . .   | 97                | 96   | 97   | 97                | 100      | 104      | 86   | 95     | 97    | 96        | 98                 | 107    | 95                      | 98        |
| Tentorio-lambdal diameter . . .   | 66                | 68   | 71   | 56                | 73       | 79       | 73   | 70     | 74    | 68        | 68                 | 72     | 62                      | 61        |
| Tentorio-occipital diameter . . .   | 37                | 38   | 48   | 45                | 49       | 45       | 43   | 27     | 54    | 49        | 63                 | 37     | 47                      | 24        |
| Collective height of vault in four diameters above tentorial plane, sum . . . | 293               | 295  | 309  | 294               | 319      | 330      | 290  | 280    | 321   | 306       | 325                | 319    | 301                     | 280       |
| Glabello-occipital length and collective height .                             | 468               | 461  | 484  | 474               | 496      | 507      | 481  | 459    | 509   | 482       | 508                | 498    | 480                     | 455       |
| Parieto-squamous breadth . . .  | 131               | 120  | 131  | 125               | 123      | 126      | 141  | 127    | 135   | 135       | 133                | 131    | 130                     | 130       |
| Length, breadth, and collective height above tentorial plane, sum .           | 599               | 581  | 615  | 599               | 619      | 633      | 622  | 586    | 644   | 617       | 641                | 629    | 610                     | 585       |
| Length, breadth, and collective height of five radii from basion, sum . . .   | 859               | 778  | 824  | 868               | 868      | 861      | 895  | 855    | 903   | 847       | 880                | 903    | 870                     | 880       |
| Cubic capacity . . .  | 1250              | 944  | 1200 | 1238              | 1250     | 1315     | 1388 | 1210   | 1435  | 1246      | 1414               | 1420   | 1240                    | 1320      |

Of the four radii which passed through the entire cranial cavity in fourteen male skulls in the Table, the basi-perpendicular was in six somewhat the longest, in four it was equal with the basi-bregmatic, and in three somewhat less than the basi-bregmatic. The difference between the basi-perpendicular and the basi-bregmatic radii was so slight that the basi-bregmatic may be regarded as expressing in the mean the height of the cranium. The long diameter from the basi-perpendicular to the occipital pole was much less than from the perpendicular to the glabella or to the most projecting part of the vault of the frontal. The basi-lambdal was always less than the basi-bregmatic, and the basi-occipital was the shortest of the four radii which traversed the supratentorial part of the cavity.

When longitudinal and mesial sections were made through the skulls the length and the height of the supratentorial, or cerebral, part of the cavity could be precisely measured, but in skulls where a tracing of the contour has been made these dimensions could only be approximately estimated by deducting from the tentorial diameters as many

millimetres as would represent the thickness of the bone of the cranial vault at the points of measurement.

The greatest length and breadth, along with the collective measurements of the height radii from the basion to the vault, expressed the diameters of the skull in the dimensions of length, breadth and height. In the fourteen male Dravidians the sum of these dimensions showed a range of variation from 778 to 903 mm. The two extremes were exceptional, and the other crania ranged from 824 to 895, the mean being 863.4 mm. Some anthropologists have considered that an approximate estimate of the internal capacity of the skull can be obtained from the external dimensions of length and breadth, along with one radius of height. It ought, however, to be kept in mind that the curve of the vault of the cranium in any plane is not a segment of a sphere, but varies in its degree of curvature, more especially when the height is measured in the living head from the auditory meatus, or in the skull from the basion. An estimate based on such measurements cannot, I consider, adequately express the cranial capacity. I have given in Table IV. the sum of five radii from the basion for the collective height, which, along with the greatest length and breadth, more completely embodies the three dimensions, in which, however, the thickness of the bones of the vault is included. For purposes of comparison this Table includes the actual capacity of the crania obtained by the method described many years ago in my *Challenger Report* (1884), the merits of which have been confirmed by subsequent experience in the cubage of hundreds of crania. The sum of the external dimensions, however, does not bear a constant relation to the actual capacity as determined by the method of cubing, but varies in some cases from about  $\frac{1}{4}$ ths, in others  $\frac{1}{3}$ ths, and in others  $\frac{1}{2}$ ths of the actual cubic capacity.

In previous memoirs, more especially those on the crania of the Tasmanians,\* I have drawn on the tracings of the sagittal contours the chords of the frontal, parietal, and occipital arcs; I have also erected a perpendicular from each chord to the most prominent part of the arc of each bone, so as to measure the greatest projection of each arc.

The same practice has been adopted in the study of the male Dravidian skulls, and the results are recorded in Table V.

The nasio-bregmatic chord varied in this series of crania from 97 to 115 mm., the mean being 109. The bregma-lambda chord in one skull was only 99, in four 120, and in one 122, the mean being 112. The lambda-inial chord was the shortest; in four crania it was below 60, in only three did it reach from 70 to 76, and the mean was 64. In considering the length of the perpendicular drawn from each chord to the most projecting part of its arc, the thickness of the bone at that spot is included with the corresponding diameter of the cavity. When the contour had been obtained in a skull sectionally made, as in the Gond skull No. 1, the thickness of the frontal bone at the bregma-nasal perpendicular was 10 mm., which, subtracted from the length, 28 mm., of that line, left 18 mm. for the perpendicular in the corresponding part of the cranial

\* *Trans. Roy. Soc. Edin.*, vol. xlv., part ii., 1908, and vol. xlvii., part iii., 1910.



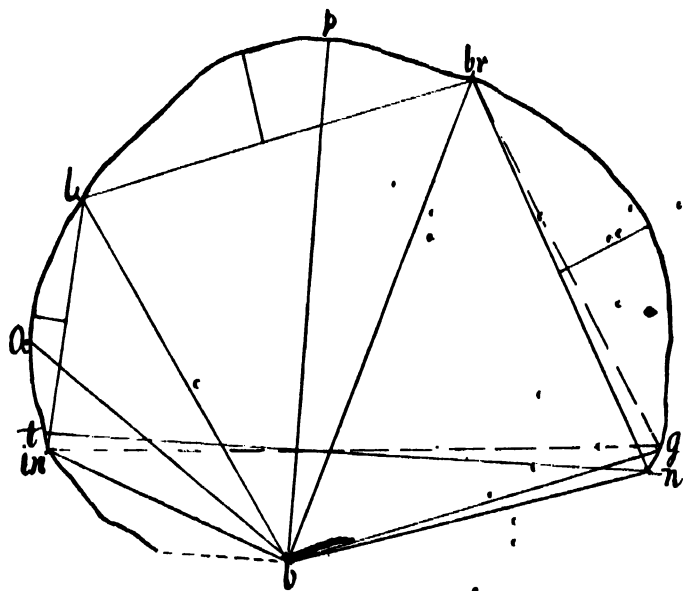


FIG. 77.—Bhil, No. 8.

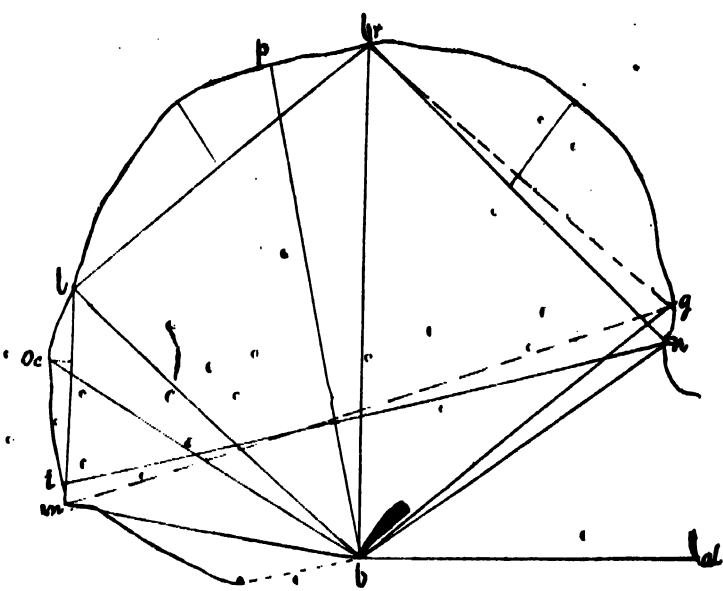


FIG. 78.—Bhil, No. 7.

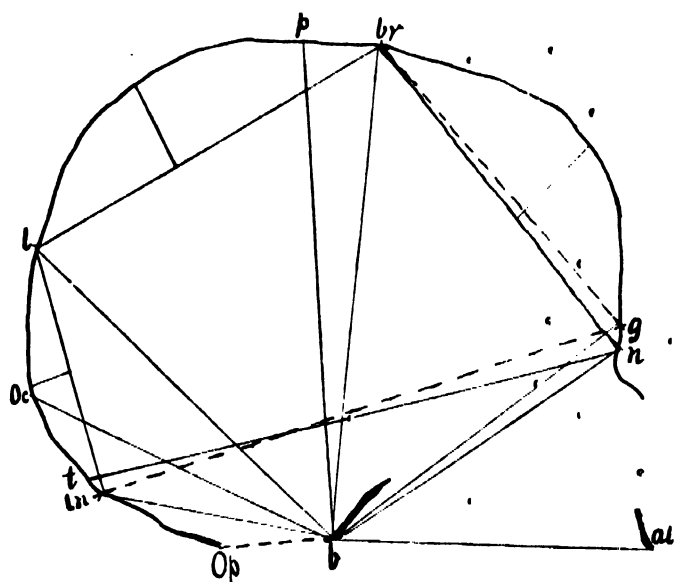


FIG. 79.—Gond, D. 4.

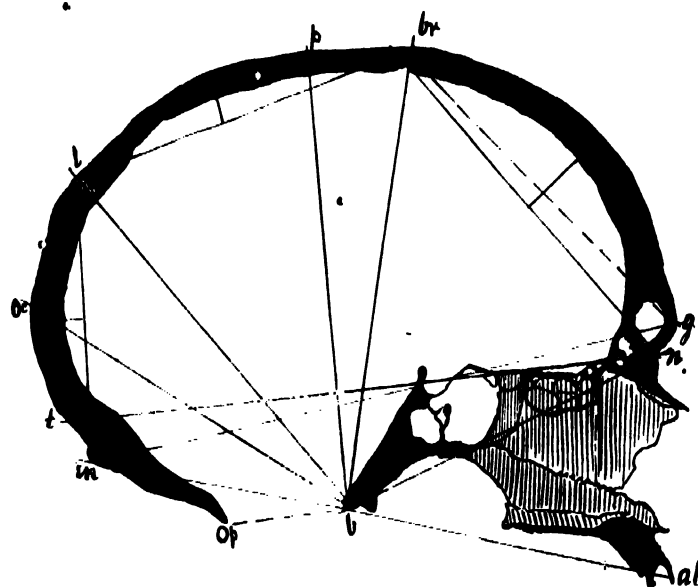


FIG. 80.—Kol.

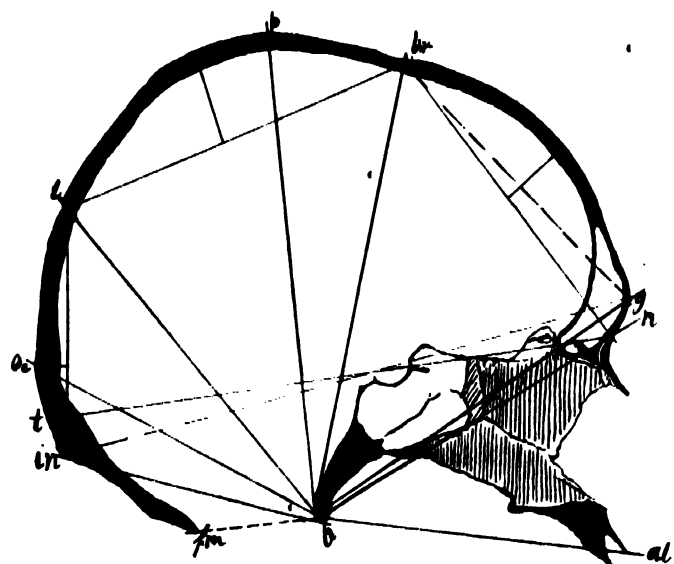


FIG. 81.—Múnda.

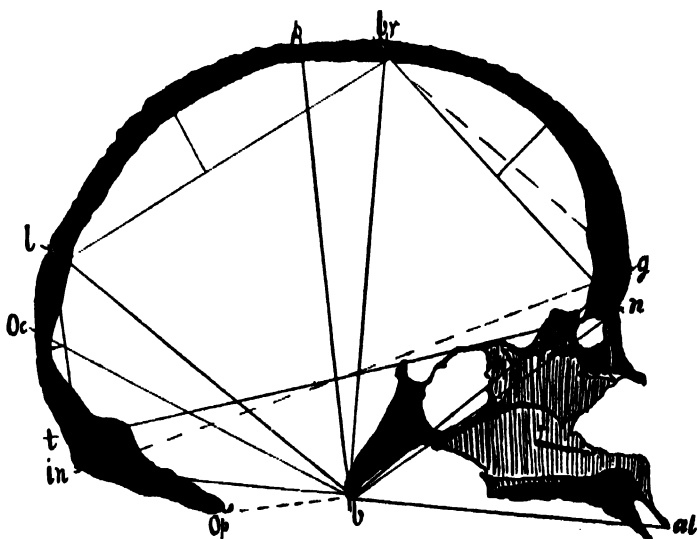


FIG. 82.—Turi.

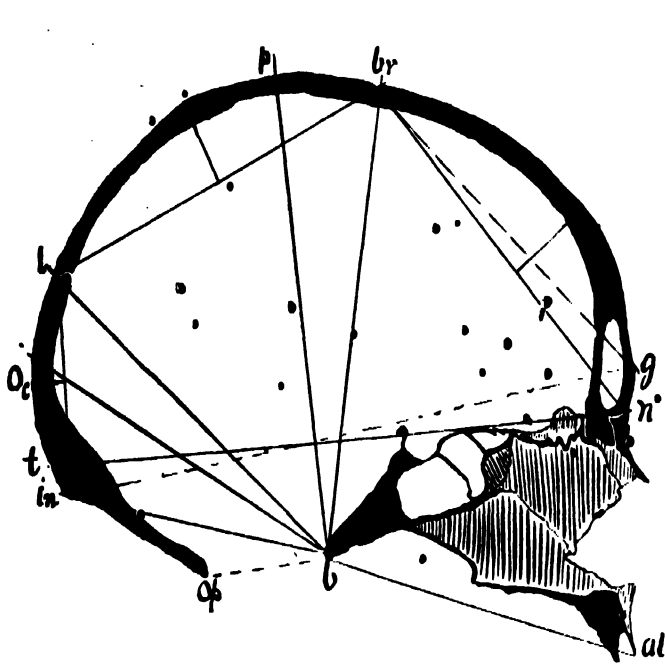
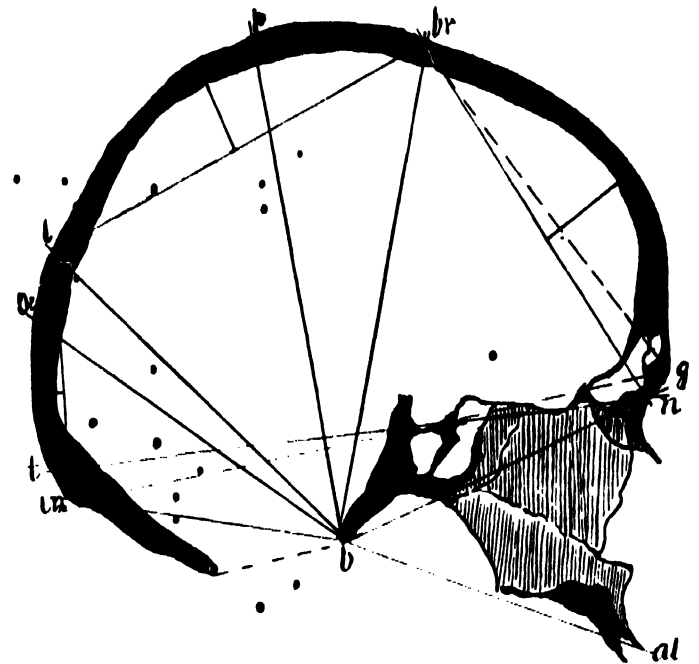


FIG. 83. — Pahariya.



• FIG. 84. — Bhoomiz (Santal).

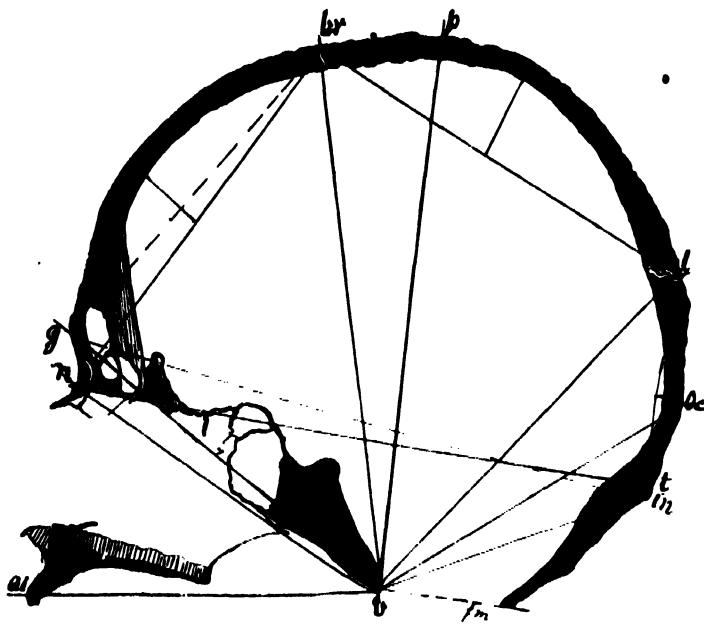


FIG. 85. — Juang.

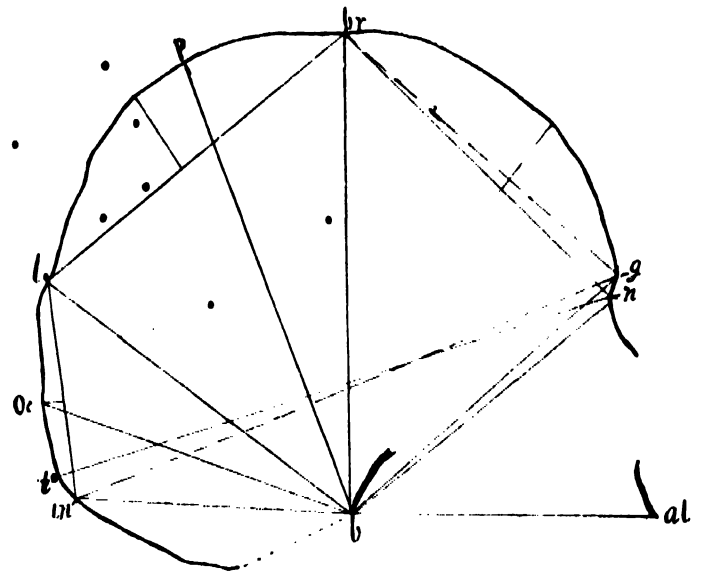


FIG. 86. — Tamil Sudra, H. 8.

## EXPLANATION OF LETTERING.

|              |                 |           |  |              |                       |
|--------------|-----------------|-----------|--|--------------|-----------------------|
| <i>b.</i>    | Basion.         |           |  | <i>b.in.</i> | Basi-inial diameter.  |
| <i>b.al.</i> | Basi-alveolar   | diameter. |  | <i>g.</i>    | Glabella.             |
| <i>b.n.</i>  | „ nasal         | „         |  | <i>g.in.</i> | Glabello-inial plane. |
| <i>b.br.</i> | „ bregmatic     | „         |  | <i>n.t.</i>  | Nasio-tentorial „     |
| <i>b.p.</i>  | „ perpendicular | „         |  | <i>op.</i>   | Opisthion.            |
| <i>b.l.</i>  | „ lambdal       | „         |  | <i>f.m.</i>  | Foramen magnum.       |
| <i>b.oc.</i> | „ occipital     |           |  |              |                       |

cavity. In the Múnda skull, again, the bregma-nasal perpendicular was 21 mm., the frontal was only 4 mm. thick, and the perpendicular in the cavity was 17 mm. Other examples also could be given to show the importance of deducting the thickness of the vault from the bregma-nasal perpendicular in the tracings on the surface of the crania, in estimating the proportion which the most projecting part of the frontal bone bears to the space occupied by the cerebrum. In each skull the lambda-inial perpendicular was relatively short, ranging from 6 to 16 mm., with a mean 9·3 mm.; the bregma-lambda perpendicular was much longer, ranging from 14 to 29, the mean being 23·8; whilst the bregma-nasal perpendicular, which expressed the projection of the frontal bone, was somewhat longer, ranging from 21 to 31, with a mean 26·9 mm.

TABLE V.—*Dravidian Tribes.*

|  | Br̃s.   |         |         | Gonds.  |         |         | Kol.    | Múnda. | Turi.   | Pahariya. | Bhoomiz Santal. | Juang.  | Tamil Sudra. |         |
|--|---------|---------|---------|---------|---------|---------|---------|--------|---------|-----------|-----------------|---------|--------------|---------|
|  | 7.      | 8.      | 9.      | A. 1.   | B. 2.   | D. 4.   |         |        |         |           |                 |         | 8.           | 10.     |
| Nasio-bregmatic chord of frontal, <i>br.n.</i>           | mm. 108 | mm. 102 | mm. 101 | mm. 114 | mm. 113 | mm. 110 | mm. 110 | mm. 97 | mm. 108 | mm. 112   | mm. 115         | mm. 109 | mm. 115      | mm. 112 |
| Bregma-nasal perpendicular to outer surface of frontal   | 23      | 26      | 23      | 28      | 30      | 30      | 29      | 21     | 28      | 26        | 31              | 25      | 29           | 28      |
| Bregma-lambda chord of parietal, <i>br.l.</i>            | 112     | 104     | 107     | 120     | 111     | 116     | 106     | 99     | 120     | 107       | 120             | 122     | 106          | 120     |
| Bregma-lambda perpendicular to outer surface of parietal | 24      | 22      | 23      | 29      | 20      | 26      | 14      | 26     | 27      | 23        | 25              | 28      | 20           | 27      |
| Lambda-inial chord of occipital, <i>lin.</i>             | 59      | 60      | 65      | 61      | 62      | 70      | 76      | 69     | 65      | 58        | 65              | 59      | 57           | 70      |
| Lambda-inial perpendicular to outer surface of occipital | 6       | 9       | 10      | 10      | 6       | 13      | 16      | 10     | 9       | 9         | 9               | 8       | 6            | 10      |
| Glabello-inial diameter                                  | 176     | 158     | 168     | 171     | 172     | 161     | 177     | 175    | 182     | 169       | 176             | 174     | 180          | 168     |
| Bregma-glabellar chord                                   | 106     | 99      | 98      | 111     | 107     | 106     | 110     | 93     | 103     | 104       | 112             | 104     | 111          | 105     |
| Bregma-glabellar perpendicular                           | 20      | 23      | 22      | 23      | 24      | 26      | 23      | 17     | 23      | 20        | 25              | 19      | 25           | 22      |
| Bregma angle (SCHWALBE)                                  | 60°     | 63°     | 60°     | 63°     | 59°     | 56°     | 71°     | 63°    | 64°     | 71°       | 60°             | 68°     | 70°          | 50°     |
| Bregma-nasio-tentorial angle (TURNER)                    | 57°     | 60°     | 59°     | 60°     | 61°     | 67°     | 74°     | 65°    | 63°     | 71°       | 60°             | 60°     | 69°          | 58°     |

In this memoir, as in Part II. on the Aborigines of Tasmania,\* I measured the angle formed by the anterior end of the glabello-inial diameter with that of the bregma-glabellar chord, the *bregma angle* of SCHWALBE. This angle (Table V.) in three Dravidian skulls was from 50° to 59°, three were 70° to 71°, but the majority ranged between 60° and 68°, whilst the mean of the series was 62·7°. In seven Tasmanian skulls I found that the bregma angle ranged from 54° to 60°, with a mean 57·1°; and in seventeen Australians the range was from 50° to 62°, with a mean also 57·1°. The Dravidian skulls, whilst showing a much greater range of variation, had a higher mean, a more open angle, which, in relation to the glabello-inial diameter, expressed a higher degree of frontal elevation.

I have also stated in Table V. the angle formed by the junction of the anterior

\* *Trans. Roy. Soc. Edin.*, vol. xlvii. p. 448, 1910.

end of the nasio-tentorial diameter with the nasio-bregmatic chord of the frontal, *i.e.* the *bregma-nasio-tentorial angle*. This angle ranged from  $57^{\circ}$  in a Bhil to  $74^{\circ}$  in the Kōl, and the mean of the series was  $63.1^{\circ}$ , a fraction greater than the bregma angle; though a comparison of the two angles will show that in one-half the number of skulls the bregma angle was a little more than the bregma-nasio-tentorial, in two specimens they were equal, and in five the latter was somewhat the greater. In the Tasmanian skulls previously recorded the mean bregma-nasio-tentorial angle was  $55.5^{\circ}$ , and in the Australians it was  $58.4^{\circ}$ . In the Dravidians, therefore, this angle, though in the mean more open than in those two races, yet, as regards individual skulls, it was sometimes greater, at others less, and in one skull it was equal to the bregma angle.

### FRONTIER TRIBES OF BURMA.

I am indebted to Colonel G. J. H. BELL, Inspector-General of Prisons, who, at the request of Surgeon-General SINCLAIR, forwarded to me in the summer of 1910, for the Anatomical Museum, thirteen skulls collected by medical officers living on the frontiers of Burma. Burma is divided administratively \* into (a) Northern or Upper Burma, which includes the Chindwins and the Chin and Kachin Hills; (b) Burma proper or Lower Burma, practically the valley of the Irawaddy to the south of the gorge; (c) the Shan Tributary States, subdivided into the Northern and Southern States. The Northern States are for the most part south of Bhamo and west of the Salween River, between it and Mandalay, though they also include those Wa States which are to the east of that river. The Southern Shan States are partly to the west of the Salween, but cross it eastward as far as the Mehong River; China forms their eastern boundary, and Siam and Kareni lie to the south.

#### PAKÔKKU DISTRICT.

Pakôkku is an extensive district in Upper Burma, bounded on the west by the Chin Hills, on the north by the upper and lower Chindwin districts, on the east by the Chindwin River where it joins the Irawaddy, on the south by the Mimbū area situated on the west bank of the Irawaddy and by the Myingyan area on its east bank. I owe to Captain H. J. AUGUSTINE, I.M.S., Civil Surgeon in Pakôkku, one group of skulls, eight in number, which were collected by the subdivisional officer at Gangaw, in the north-western part of the district. Two skulls were marked Chinbôk, two Taungtha, and four Yaw.

#### CHINBÔKS. TABLE VI. (Plates XII., XIII.)

The Chin Hills are situated to the west of the Chindwins and Pakôkku, and are occupied by tribes known generally as the Chins. They have already been referred to and their skulls described in Part I. of these memoirs on the Craniology of the people

\* *Upper Burma and Shan States Gazetteer*, vol. i. part i., p. 3, Rangoon, 1900.

of India.\* Up to 1892 the Northern Chin Hill tracts were administered from Fort White, the Southern from Haka, but they have since that date formed a single district administered from Falam, a village of the Tashôns.†

The Chinbôks are one of the tribes, and live in the hills from the Maw River to the Sawchaung. The men averaged about  $5\frac{1}{2}$  feet in stature; they wore a loin-cloth and a piece of cloth suspended by string from the shoulders; the women wore a loin-cloth and a sleeveless jacket or jersey. The hair was not cut and was tied into a knot on the top of the head. Both sexes wore bracelets, necklaces, earrings, feathers, and the skins were tattooed. They smoked, drank, danced, and had musical instruments. The men were armed with bows and with daggers. They lived in village communities and cultivated the soil. Their religion was a primitive form of spirit-worship with sacrifices. They cremated the dead, though the Chins proper buried the bodies.

Two skulls, marked Chinbôks Nos. 20, 21, were obtained in Pakôkku by Captain AUGUSTINE; one was aged and toothless, the other was adult, and both were apparently males.

*Norma verticalis*.—Cranial outline elongated and ovoid, cephalic index respectively 72·7 and 75·7, the mean, 74·2, was dolichocephalic. Sagittal line was somewhat raised, and as the skull sloped steeply to the parietal eminence, the vault was roof-shaped, though it arched in its curve from before backwards to the lambda. The parietal eminences were feeble and the side walls were nearly vertical. In one the occipital squama was flattened, in the other it was a little convex; the inion, the supra-inial line, the curved lines, and the processus retromastoideus were distinct. In one the anterior and posterior supramastoid tubercles were distinct. The skulls were phænozygous; one rested behind on the mastoids, the other on the convex cerebellar surface of the occiput.

*Norma lateralis*.—The lower or facial forehead somewhat receded, the glabella and superciliary ridges were moderate, and the latter were separated from the supra-orbital border by a foramen; no torus supraorbitalis; moderate supraorbital trigone; feeble supraorbital transverse depression; frontal eminences feeble, bone not metopic. Nasion a little depressed, lower ends of nasals projected forwards, bridge slightly keeled and concave; internasal suture 20 and 26 mm. respectively, greatest breadth of nasal 12 mm. In one the parietal longitudinal arc was the longest, in the other the frontal, in both the occipital arc was the shortest.

*Norma facialis*.—The anterior nares were bounded in the aged skull by a sharp crista prænasalis which reached the maxillo-nasal spine and formed a definite ridge dividing the nasal floor from the incisive region. In the adult the crista was not sharp, did not form a dividing ridge, and a shallow post-nasal groove was present; the incisive fossæ were deep. The height of the nose was 53 and 49 mm. respectively, and the greatest width of the nares was 27 mm.; the mean nasal index, 51, was mesorhine. The com-

\* *Trans. Roy. Soc. Edin.*, vol. xxxix., 1899.

† *Upper Burma and Shan States Gazetteer*, part i., vol. i., Rangoon, 1900.

TABLE VI.—*Tribes of the Pakôkku District.*

Group XXI., Sub-group F.

|                                    | Chinbôks. |       | Taungtha. |       | Yaws. |       |       |       |
|------------------------------------|-----------|-------|-----------|-------|-------|-------|-------|-------|
|                                    | 20        | 21    | 22        | 23    | 24    | 25    | 26    | 27    |
| Collection number                  | 20        | 21    | 22        | 23    | 24    | 25    | 26    | 27    |
| Age                                | • Aged    | Ad.   | Ad.       | Juv.  | Ad.   | Aged  | Aged  | Ad.   |
| Sex                                | M.        | M.    | M.        | ...   | M.    | M.    | M.    | F.    |
| Cubic capacity                     | 1320      | 1310  | 1480      | ...   | 1570  | 1270  | 1360  | 1329  |
| Glabello occipital length          | 183       | 177   | 183       | 159   | 175   | 165   | 179   | 182   |
| Basi-bregmatic height              | 141       | 136   | 139       | 124   | 143   | 135   | 138   | 132   |
| Vertical Index                     | 77        | 76.8  | 76        | 78    | 81.7  | 81.8  | 77.1  | 72.5  |
| Minimum frontal diameter           | 95        | 92    | 86        | 79    | 98    | 91    | 89    | 88    |
| Stephanic diameter                 | 99        | 100   | 91        | ...   | 111   | 111   | 111   | 106   |
| Asterionic diameter                | 103       | 100   | 113       | 104   | 104   | 106   | 107   | 104   |
| Greatest parieto-squamous breadth  | 133s.     | 134s. | 135s.     | 138s. | 144s. | 141s. | 138s. | 135s. |
| Cephalic Index                     | 72.7      | 75.7  | 73.8      | 86.8  | 82.3  | 85.5  | 77.1  | 74.2  |
| Horizontal circumference           | 512       | 498   | 509       | ...   | 510   | 493   | 506   | 505   |
| Frontal longitudinal arc           | 130       | 133   | 133       | 123   | 128   | 127   | 124   | 130   |
| Parietal "                         | 136       | 131   | 131       | 117   | 120   | 119   | 132   | 123   |
| Occipital "                        | 105       | 114   | 119       | 110   | 123   | 99    | 110   | 125   |
| Total "                            | 371       | 378   | 383       | 350   | 371   | 345   | 366   | 378   |
| Vertical transverse arc            | 305       | 287   | 297       | ...   | 322   | 300   | 300   | 297   |
| Basal transverse diameter          | 124       | 123   | 121       | ...   | 126   | 121   | 116   | 116   |
| Vertical transverse circumference  | 429       | 410   | 418       | ...   | 448   | 421   | 416   | 409   |
| Length of foramen magnum           | 35        | 32    | 34        | 32    | 39    | 32    | 36    | 34    |
| Basi-nasal length                  | 108       | 89    | 102       | 82    | 104   | 98    | 101   | 98    |
| Basi-alveolar length               | ...       | 88    | 100       | 76    | 95    | 93    | ...   | 100   |
| Gnathic Index                      | ...       | 98.9  | 98        | 92.6  | 91.3  | 94.9  | ...   | 104.2 |
| Total longitudinal circumference   | 514       | 499   | 519       | ...   | 514   | 475   | 503   | 510   |
| Interzygomatic breadth             | 136       | 130   | 127       | ...   | 133   | 132   | 127   | 120   |
| Internalar "                       | 124       | 116   | 115       | ...   | 120   | 121   | 114   | 110   |
| Nasio-mental length                | ...       | 119   | 120       | ...   | ...   | ...   | ...   | 109   |
| Nasio-mental complete facial Index | ...       | 91.5  | 94.5      | ...   | ...   | ...   | ...   | 90.8  |
| Nasio-alveolar length              | ...       | 67    | 66        | 57    | 70    | 75    | ...   | 66    |
| Maxillo-facial Index               | ...       | 51.5  | 51.9      | ...   | 53.6  | 56.8  | ...   | 55.5  |
| Nasal height                       | 53        | 49    | 48        | 40    | 54    | 53    | 48    | 49    |
| Nasal width                        | 27        | 25    | 26        | 25    | 25    | 27    | 24    | 25    |
| Nasal Index                        | 50.9      | 51    | 54.2      | 62.5  | 46.3  | 50.9  | 50    | 51    |
| Orbital width                      | 40        | 36    | 38        | 33    | 40    | 40    | 37    | 36    |
| Orbital height                     | 34        | 33    | 30        | 31    | 37    | 37    | 36    | 31    |
| Orbital Index                      | 85        | 91.7  | 78.9      | 93.9  | 92.5  | 92.5  | 97.3  | 86.1  |
| Palato-maxillary length            | ...       | 53    | 53        | 39    | 48    | 53    | ...   | 53    |
| Palato-maxillary breadth           | ...       | 65    | 64        | 58    | 65    | 60    | ...   | 65    |
| Palato-maxillary Index             | ...       | 122.6 | 120.7     | 148.7 | 135.4 | 113.2 | ...   | 122.6 |
| Nasio-malar Index                  | 111.7     | 106.5 | 107.3     | 107.5 | 110.7 | 105.9 | 105.3 | 104.3 |
| Cranio-facial Index                | 74.3      | 73.4  | 69.4      | ...   | 76    | 80    | 70.9  | 65.9  |
| Lower jaw.                         |           |       |           |       |       |       |       |       |
| Symphysial height                  | ...       | 54    | 34        | 23    | ...   | ...   | ...   | 31    |
| Coronoid "                         | 62        | 57    | 63        | 39    | ...   | ...   | ...   | 54    |
| Condylod "                         | 52        | 66    | 69        | 40    | ...   | ...   | ...   | 56    |
| Gonio-symphysial length            | ...       | 83    | 85        | 61    | ...   | ...   | ...   | 87    |
| Inter-gonial width                 | 110       | 99    | 99        | 80    | ...   | ...   | ...   | 92    |
| Breadth of ascending ramus         | 34        | 32    | 34        | 26    | ...   | ...   | ...   | 37    |

plete facial index in the adult was 91·5, its maxillo-facial index was 51·5; both indices were high-faced, leptoprosopic. The gnathic index in the same skull, 98·9, was prognathous; the canine fossæ were moderately deep. The nasio-malar index in the aged skull was 111·7, prosopic; in the adult 106·5, mesopic. The fronto-malar border of the orbit was thickened, the infraorbital suture was faint in the adult, the interorbital width was 23 and 25 mm. respectively, the orbital index, 91·7, in the adult was megaseme, in the aged the index, 85, was mesoseme. The hard palate in the adult was high-arched and roughened and the teeth were somewhat worn, the palato-maxillary index, 122·6, was hyperbrachyuranic. The lower jaw had a projecting chin, the angle was obtuse, the coronoid feeble, and the muscular markings moderate. The alveolar border was feeble. In the aged the jaw was toothless and senile.

In the adult the cranial sutures were distinct; small Wormians in lambdoid, no epipteries; no third condyl, nor pterygo-spinous plate, nor flattening of occipital condyls; one jugal was tuberculated. In the aged skull the sutures were obliterated, the styloids were ossified; the compartment for the right jugular vein in the foramen was very large, that for the left was almost obliterated.

The mean vertical index was 70·9, hypsicephalic, or high skull. In each skull the basi-bregmatic height was more than the greatest breadth. The mean breadth-height index was 103·5. In this respect these skulls were hypsistenocephalic, *i.e.* they were high and narrow, a character which I have recognised and described elsewhere\* as present in many dolichocephalic aboriginal races. The cranio-facial index, computed by dividing the interzygomatic breadth  $\times 100$  by the glabello-occipital length, was in one skull 73·4, in the other 74·3. The cranio-facial index therefore was low, which is a frequent character of the dolichocephalic skull, a relatively long and narrow skull being associated with a relatively high and narrow face.

In Part I.† I described five skulls, with measurements and figures, collected at Jiddim in the North Chin Hills, also one from Klungroa in the South Chin Hills. They formed a homogeneous group, the cephalic index of which ranged from 71·0 to 77·5, the mean being 75; they were therefore either dolichocephalic or in the lower term of the mesaticephalic group; the vertical index ranged from 70·7 to 78·6, two were relatively high, hypsicephalic, but no specimen was low or chamæcephalic, and the mean, 73·4, was metriocephalic, moderate in height. The mean gnathic index was 97·6, orthognathous, though one skull, with index 106·5, was prognathous. The mean nasal index was 52·1, mesorhine or moderate in the relative width of the anterior nares, though three were platyrhine, wide nostrils, with the index above 53. The mean orbital index, 90·2, was high, as a rule they were megaseme, and only one specimen had a low orbit with microseme index. The mean maxillo- or upper facial index, 50·4, was high and narrow, leptoprosopic in proportion, but when the lower jaw was included the complete facial index was much lower, chamæprosopic, which

\* See my memoir, "The Craniology of the People of Septland," in *Trans. Roy. Soc. Edin.*, vol. xl, p. 599, 1903.

† *Trans. Roy. Soc. Edin.*, vol. xxxix., part iii., 1899.

pointed to a comparatively feeble mandible, though two specimens approached the leptoprosopic group.

In their characters the two Chinbôk skulls now described corresponded generally with those from the Chin Hills previously recorded. The mean cephalic index, 74·2, was dolichocephalic; the height in each skull was greater than the breadth, they were hypsicephalic, and the mean vertical index was 76·9. The gnathic index, 98·9, could be computed in only one skull, a shade above the conventional limit of orthognathism. The mean nasal index was 50·95; mesorhine. The orbit in one was high and the index was megaseme, in the other it was moderate or mesoseme. The lower jaw was present in only one skull, the complete facial index of which, 91·5, was leptoprosopic, narrow and high-faced, which was also the proportion of the upper or maxillo-facial index, 51·5. The mean cubic capacity of the two male Chinbôk crania was 1315 c.c., which corresponded exactly with the mean capacity of the five male skulls from the Chin Hills described in Part I.

There can, I consider, be no doubt that the Chinbôk skulls were those of men of the same race as the inhabitants of the Chin Hills, who had probably left their native mountains for the lower grounds in the Pakôkku district. I had also in Part I. described five skulls of the people who occupy the Lushai Hills, which extend westwards from the Chin Mountains. Two of them were brachycephalic, but the others had a mean cephalic index, 74·6. Of these dolichocephalic specimens it may be said that they were probably the same race as the Chins, or at least that they had close affinities with them.

#### TAUNGTHA. TABLE VI. (Plate XIII.)

The Taungtha or Taungthu skulls were received from Tilin, a township in Pakôkku, which is situated east of the Chin Hills and has the Yaw township to the south and Gangaw to the north. It is stated in the *Gazetteer* that they form nearly half the population of the Myelat,\* and the state of Thaton (Hsa-htung) is so completely Taungtha that the Myoza is of that race; they are said to extend also into the western part of the Southern Shan States. They live in villages by themselves, and are nominally Buddhists but practically spirit-worshippers. Their language is distinct from Burmese and is like the Chinbôk. Colonel LEWIN, for many years Deputy Commissioner in the Chittagong district, regards the term Taungtha as signifying "children of the hills,"† and under this name he includes the Tipperah tribes and the Lushais or Kookies with their offshoots.

Two skulls were labelled Taungtha, an adult male and a child in the first dentition.

*Norma verticalis*.—The adult cranium No. 22 was elongated and ovoid in its outline, and the cephalic index was 73·8, dolichocephalic. It was not keeled, the slope outwards

\* The term Myelat, i.e. Middle Country, is applied to Pakôkku and neighbouring districts, which form the middle part of Burma, at the limits of Upper and Lower Burma. The population of Pakôkku is stated (*Gazetteer*, vol. B) as about 360,000 in 1901, of which the Burmese numbered 341,360, the Chins 6535, the Taungthas 5701.

† *Hill Tribes of Chittagong*, 1869.



to the parietal eminences was steep and the side walls were almost vertical, the post-parietal region was not flattened and the occipital squama was bulging; the inion and curved lines were moderate and the processus retromastoideus was distinct. The skull was phænozygous.

The lower facial forehead slightly receded; the glabella and superciliary ridges were moderate, and the latter were separated from the supraorbital borders by the notch; the trigone was distinct and slightly concave, the transverse supraorbital depression and the frontal eminences were moderate, the bone was not metopic. The nasion was a little depressed, the internasal suture was 23 mm. long, the nasal bone was 11 mm. wide, the interorbital width was 22 mm. The mastoids were moderate. The frontal longitudinal arc was the longest, the occipital was the shortest.

*Norma facialis.*—The sharp lateral border of the anterior nares faded away on the incisor fossa; behind it was a narrow prænasal fossa bounded behind by the margo infranasalis in the wall of the inferior meatus, which also formed a sharp border separating the nasal floor from the incisive region, and ended in the feeble maxillo-nasal spine. The nasal height was 48 mm., its width 26 mm., the index, 54·2, was platyrrhine. Although the gnathic index was only 98, the alveolar border was directed obliquely forward and showed alveolar prognathism. The orbital index was only 78·9, and the orbits were low, microseme. The canine fossæ were deep. The hard palate was highly arched, the teeth were partially worn; the palato-maxillary index was 120·7, brachyuranic. The lower jaw was strong, chin square projecting, alveoli deep, teeth worn, angle almost rectangular, coronoid broadly triangular, mental foramen placed below second premolar. The complete facial index, 94·5, and the maxillo-facial index, 51·9, showed the face to be high and narrow, or leptoprosopic.

The cranial sutures were distinct; no Wormian nor epipterice bones, nor third condyl, nor pterygo-spinous plate were seen. The jugal processes were tuberculated, and a strong paramastoid was separated from the mastoid by a deep mastoid groove. The styloid processes were ossified and the glenoid fossæ were deeply concave. The basi-bregmatic height exceeded the greatest breadth, and the vertical index was 76. The breadth-height index was 102·9, and the skull was high and narrow, or hypsistenocephalic. The cranio-facial index was 69·4 and was therefore less than the cephalic. The nasio-malar index, 107·3, was mesopic.

The skull of the child Taungtha No. 23, judging from the dentition, was about seven years of age. Its dimensions are recorded in Table VI., from which it can be seen that it was hyperbrachycephalic, 86·8, and the cephalic index was greatly in excess of the vertical index, 78. It had the customary characters of a child's skull. The gnathic index, 92·6, was orthognathous; the nasal index, 62·5, was platyrrhine; the orbital aperture was rounded and the index, 93·9, was megaseme; the hard palate was low, the maxillo-premaxillary suture was distinct, and the palato-maxillary index, 148·7, was hyperbrachyuranic. The nasio-malar index, 107·5, was mesopic. The squamoso-temporal bones were absent. In the lower jaw the chin was feeble, not project-

ing, the alveoli were shallow, the muscular markings feeble, the angle obtuse, and the mental foramen was below the interval between the first and second milk molar teeth.

The skull of the child differed materially in its relative proportions from that of the adult male, and was so immature that its characters can have little value in determining the race. The adult corresponded in its relative dimensions with the Chinbôks, and as they are also said to agree in language, they are doubtless of the same race.

#### YAWS. TABLE VI. (Plates XIII., XIV.)

The Yaws live in the Yaw Valley subdivision of the district of Pakôkku. The skulls received were from the Yawdwin township, situated to the east of the Chin Hills. The Yaws are sometimes regarded as a Burmese tribe; the Shans claim them to be Shans, and they may be the earlier owners of the land. Some are civilised through contact with the Burmese. In the Census of 1891 only 370 returned themselves as pure-blooded Yaws, and the writer in the *Gazetteer* thinks that before long they may disappear as a separate entry in the Census. Skulls collected in this district probably therefore represent people of mixed race.

The four skulls marked Yaw were apparently three males and one female. They had reached adult age, and two were advanced in years. The skull of the female retained the lower jaw. They differed materially in the cranial relations of length and breadth. Two males were definitely brachycephalic, a third male was mesaticephalic, 77·1, approximating to dolichocephalic, and the female was in the dolichocephalic group, 74·2.

The brachycephalic crania, Nos. 24, 25, had the cephalic index 82·3 and 85·5 respectively. In the *norma verticalis* they were rounded in outline, not ridged in the sagittal region, the vault sloped downwards moderately to the parietal eminences, and the widest diameter was in the parieto-squamous region. The parieto-occipital slope was steep and flattened from side to side in the occipital squama, though without definite evidence of artificial flattening during infancy. Theinion and crista were strong in one but not in the other, the skulls were cryptozygous.

*Norma lateralis*.—The facial or lower forehead receded somewhat more in one than in the other. The glabella and superciliary ridges were moderate, and the latter were differentiated by a notch from the supraorbital border; the torus supraorbitalis was not formed, the transverse supraorbital depression was slight, the supraorbital trigone was flattened. The frontal eminences were moderate and the bone was not metopic. The nasion was not depressed, the nasal bones projected only slightly, the bridge was slightly keeled in one, but not in the other. The internasal suture in one was 21 mm., in the other 26 mm. long. The frontal longitudinal arc was the longest, in one the parietal arc was the shortest, in the other the occipital arc. The mastoids were moderate, and the skulls rested behind on the cerebellar part of the occipital bone.

*Norma facialis*.—In one the lateral border of the anterior nares was sharp and

ended below in the incisive region, the fossa prænasalis was faint and its posterior border passed across the floor of the nose to the ridge behind the maxillo-nasal spine. In the other skull the lateral border was thickened and ended in the maxillo-nasal spine, no definite fossa prænasalis was visible. In both the incisive fossæ were distinct and separated by a mesial ridge. The canine fossæ were distinct. The nasal index in one was 46.3, in the other 50.9, the mean was mesorhine.

The maxillo-facial index in one was leptoprosopic, in the other mesoprosopic. The gnathic index in both was orthognathous. The nasio-malar index in one was 140.7, pro-opic, in the other 105.9, platyopic. The nasal profile was a little concave. The fronto-malar border of the orbit was thickened in one skull. The intraorbital breadth was 25 mm. in one, 24 in the other. The orbital index was megaseme, high and rounded. The hard palate was highly arched, the maxillo-premaxillary suture was obliterated, the palato-maxillary index in one was mesuranic, 113.2, in the other hyperbrachyuranic, 135.4.

The cranial sutures in one were in process of fusion, no epipteric bone, nor pterygo-spinous plate, nor third condyl; in one the jugal had a tubercular para-condylar process. In one skull the breadth was more than the height, in the other they were almost equal, the vertical index was hypsiccephalic, high skulls. The mean breadth-height index was 98.2. The cranio-facial index was in the mean 78. In the males the skulls ranged in capacity from 1270 c.c. to 1570 and the mean was 1400 c.c., the capacity in the female was 1329 c.c.

Of the other two Yaw skulls, No. 27 was dolichocephalic, No. 26 was mesaticephalic. In No. 27 the feminine characters were very distinct; the occipital squama was bulging; the skull was cryptozygous. In both the anterior nares had sharp lateral borders, the prænasal fossæ were narrow and the margo infranasalis reached the maxillo-nasal spine. The nasal index was mesorhine. The orbital index in one was megaseme, in the other mesoseme. The senile edentulous condition of the jaws in one prevented their measurements from being taken, but in the female the gnathic index, 104.2, showed a degree of prognathism, whilst the maxillo-facial and complete facial indices were leptoprosopic or high-faced. In the female the teeth were only slightly worn, the lower jaw had a square projecting chin, the angle was somewhat oblique, the coronoid was short, the muscular lines and tubercles were moderate, the mental foramen was below the second premolar. The cranial sutures were distinct, the lambdoid contained a small Wormian bone, no epipterics.

The variations in type shown by the skulls from the Yaw valley supported the opinion that the people living in it are a mixed population. It is probable that those with the brachycephalic form of skull and head are similar in race to the brachycephalic Burmese; whilst those with the dolichocephalic skulls have affinities with the longer-headed tribes of the hill districts.

## SOUTH SHAN TRIBES. TABLE VII. (Plate XIV.)

The second group of skulls were received from Captain R. D. MACGREGOR, I.M.S., Civil Surgeon at Loi Mwe.\* They were five in number and belonged to various tribes in the district of Kēng Tūng (Kyaington, Kiang Tung), one of the Southern Shan States, which is situated between the Salween and Mehong Rivers, between 21° and 22° latitude.

Captain MACGREGOR writes that the skulls were obtained with considerable difficulty, as the tribes are very shy and superstitious, especially in regard to their dead. Facts as to age and sex could not be obtained. He did not himself procure them from their burial-places, but he regards his agents as trustworthy, and that the names given to the skulls are correct.

No. 1 is marked Tai Loi, a name which probably signifies Hill Shans; they are regarded as people of Wa origin who had adopted Buddhism. They have profited by Shan civilisation and bury the dead, but they still sacrifice and make offerings to spirits.

No. 2. The Tame Wa live on hills of a moderate elevation in Kēng Tūng. A section of the Wa tribes is named the Wild Wa; they occupy the country about 100 miles along the Salween River, and the watershed between it and the Mehong River, though isolated villages occur as far east as the latter river. Some Wa tribes have adopted Buddhism, but generally they are spirit-worshippers.

No. 3, marked Mu Hso, was from a tribe, called variously La'hu, Law'he, or Myen, which is said to have come originally from the region of the Irawaddy, where descendants can yet be found; but they extended their territory to the west of the Salween River, where lands were allotted to them and where they came into contact with the Was.

No. 4, marked Kwi, are apparently of the La'hu tribe; they have received from the Shans the name Kwi, but their real tribal name is Lahuchi. Their houses are built of bamboo and are raised from the ground. Marriage is monogamous. The custom of burning the dead prevails. They offer sacrifices to the spirits of the hills and forests.

No. 5 is marked Akha, a tribe which is also known as the Kaw or Hka-Kaw. They are the most numerous and most widely distributed of the tribes in the eastern hills in Kēng Tūng, and some are met with to the east of the Mehong River, where they come into contact with the Chinese. Their skin is swarthy, with coarse heavy features quite distinct from those of the Shans, and with a higher bridge to the nose and rounder eyes than the Chinese. Their characteristic feature is perhaps their pointed projecting jaw. They bury the dead. Their religion is ancestor- or spirit-worship, and they offer sacrifices.

\* I wish to express my thanks to Captain MACGREGOR and Captain AUGUSTINE not only for the skulls but for the notes which accompanied them; also for drawing my attention to the *Gazetteer of Upper Burma and the Shan States*, in which I have been able to obtain additional information regarding the distribution, appearance and habits of the people whose skulls had been collected.

In Part I. of these Indian memoirs I referred to the description of the Shans in the Kēng Tūng district given in Mr J. G. SCOTT's Report.\* He stated that the Kwi formed a numerous hill tribe. The Kaw (Akha) had more the Chinese type of face and ate dogs. The Wa were in part savages and head-hunters. The Wild Wa were said to have darker skins than the Tame Wa, and were about 5 feet 5 or 6 inches in stature.

Of the five skulls of the Kēng Tūng tribes, apparently only one (Tame Wa) was a male. It was an adult. One female (Tai Loi) was adult; another (Ma Hso) was aged; another (Kwi) was adolescent, the wisdoms had not erupted and the basi-cranial joint was not closed; in another (Akha) the facial bones were much injured, but the teeth had erupted. The lower jaw was absent in each skull.

*Norma verticalis.*—The male skull of the Tame Wa was broadly ovoid and moderately elongated, cephalic index 77·3. The others, presumably females, were more rounded, and the index ranged from 79·7 to 84·8. The sagittal line was neither keeled nor depressed. In the Tame Wa the vertex sloped rapidly to the parietal eminences; in the females it was not so steep and the transverse parietal arc was more rounded. The parietal eminences, though distinct, were not prominent except in No. 5, and the side walls below them were almost vertical. The parietal foramina were either almost or quite obliterated. In the male the parieto-occipital slope was not so abrupt as in the females. In the Kwi the post-parietal region and occipital squama were much distorted and flattened on the right, obviously from sustained artificial pressure in infancy. The supra-nial squama slightly bulged; the inion and occipital curved lines were moderate in the male, feeble in the females. The skulls were cryptozygous.

*Norma lateralis.*—In the male the lower or facial forehead receded; the glabella and superciliary ridges were moderate, each ridge was separated from the supraorbital border by a shallow supraorbital notch, sufficient to prevent a continuous torus supra-orbitalis; the supraorbital trigone and the transverse supraorbital depression were moderate. In the females the facial part of the frontal approached the vertical, the frontal eminences were moderate, the glabella and superciliary ridges were feeble, the supraorbital trigone was less distinct and there was no supraorbital transverse depression. No skull was metopic or had a mesial frontal keel. In the Kwi the artificial flattening had forced the left frontal somewhat backwards. The nasion was not depressed. In the male the lower end of the nasal bones projected forwards and the nasal profile was distinctly concave upwards; in the females these bones did not project and the nasal profile was flattened. The mesial nasal suture ranged in length from 21 to 24 mm. The greatest width of any nasal bone was 9 mm. Except in the Akha the parietal longitudinal arc was the longest; in all the females the occipital arc was the shortest; in the male the occipital and frontal longitudinal arcs were equal. The mastoids were feeble, and with two exceptions the skulls rested behind on the convex cerebellar part of the occiput.

\* Report on Administration of Shan States, 1889, 1890, and 1892-93.

TABLE VII.—*South Shan Tribes, Kēng Tūng.*

Group XXI., Sub-group L.

|  | Tame Wa. | Kwi,*<br>La Hu. | Mu Hso. | Tai Loi. | Akha,<br>Kaw. |
|--|----------|-----------------|---------|----------|---------------|
| Collection number . . . . .                  | 1        | 2               | 3       | 4        | 5             |
| Age . . . . .                                | Ad.      | Young           | Ad.     | Aged.    | Adolesc.      |
| Sex . . . . .                                | M.       | F.              | F.      | F.       | F.            |
| Cubic capacity . . . . .                     | 1400     | 1350            | 1420    | 1120     | ...           |
| Glabello-occipital length . . . . .          | 181      | 172             | 176     | 162      | 158           |
| Basi-bregmatic height . . . . .              | 129      | 134             | 136     | 124      | ...           |
| Vertical Index . . . . .                     | 71.3     | 77.9            | 77.3    | 76.5     | ...           |
| Minimum frontal diameter . . . . .           | 87       | 95              | 91      | 85       | ...           |
| Stephanic diameter . . . . .                 | 105      | 100             | 100     | 100      | 96            |
| Asterionic diameter . . . . .                | 109      | 97              | 109     | 101      | 99            |
| Greatest parieto-squamous breadth . . . . .  | 140s.    | 137s.           | 145p.   | 133s.    | 134p.         |
| Cephalic Index . . . . .                     | 77.3     | 79.7            | 82.4    | 82.1     | 84.8          |
| Horizontal circumference . . . . .           | 506      | 490             | 515     | 473      | 465           |
| Frontal longitudinal arc . . . . .           | 118      | 123             | 125     | 113      | 118           |
| Parietal . . . . .                           | 135      | 136             | 130     | 117      | 111           |
| Occipital . . . . .                          | 118      | 113             | 122     | 104      | 109           |
| Total . . . . .                              | 371      | 372             | 377     | 334      | 338           |
| Vertical transverse arc . . . . .            | 293      | 307             | 318     | 292      | 305           |
| Basal transverse diameter . . . . .          | 126      | 119             | 124     | 113      | 109           |
| Vertical transverse circumference . . . . .  | 419      | 426             | 442     | 405      | 414           |
| Length of foramen magnum . . . . .           | 34       | 35              | 33      | 29       | ...           |
| Basi-nasal length . . . . .                  | 98       | 91              | 96      | 94       | ...           |
| Basi-alveolar length . . . . .               | ...      | 85              | ...     | ...      | ...           |
| Gnathic Index . . . . .                      | ...      | 93.4            | ...     | ...      | ...           |
| Total longitudinal circumference . . . . .   | 503      | 498             | 506     | 457      | ...           |
| Interzygomatic breadth . . . . .             | 135      | 121             | 127     | 121      | ...           |
| Intermalar . . . . .                         | 121      | 110             | 110     | 111      | ...           |
| Nasio-mental length . . . . .                | ...      | ...             | ...     | ...      | ...           |
| Nasio-mental complete facial Index . . . . . | ...      | ...             | ...     | ...      | ...           |
| Nasio-alveolar length . . . . .              | ...      | 62              | ...     | ...      | ...           |
| Maxillo-facial Index . . . . .               | ...      | 51.2            | ...     | ...      | ...           |
| Nasal height . . . . .                       | ...      | 48              | 45      | 49       | ...           |
| Nasal width . . . . .                        | 26       | 23              | ...     | 26       | ...           |
| Nasal Index . . . . .                        | ...      | 47.9            | ...     | 53.1     | ...           |
| Orbital width . . . . .                      | 39       | 40              | 38      | 38       | ...           |
| Orbital height . . . . .                     | 35       | 35              | 34      | 34       | ...           |
| Orbital Index . . . . .                      | 89.7     | 87.5            | 89.5    | 89.5     | ...           |
| Palato-maxillary length . . . . .            | ...      | 46              | ...     | ...      | ...           |
| Palato-maxillary breadth . . . . .           | ...      | 61              | ...     | ...      | ...           |
| Palato-maxillary Index . . . . .             | ...      | 132.5           | ...     | ...      | ...           |
| Nasio-malar Index . . . . .                  | 105.2    | 107.5           | 106.5   | 105.5    | ...           |
| Cranio-facial Index . . . . .                | 74.5     | 70.3            | 72.1    | 74.7     | ...           |

\* Occipital distortion.

*Norma facialis.*—The face was injured in several skulls. Where the anterior nares were preserved they were bounded laterally by a sharp crista prænasalis, which became less distinct as it ended in the incisive region; immediately behind its lateral part was a narrow, shallow groove, a fossa prænasalis, the margo infranasalis of which was faint, but could be traced across the nasal floor to the feeble maxillo-nasal spine. The incisive region was not separated from the nasal floor by a sharp ridge. The nasal index of one specimen, 47.9, was almost mesorhine, that of the other, 53.1, was faintly

platyrrhine, the mean of the series was mesorrhine. The complete facial index could not be taken; in the Kwi the maxillo-facial index, 51.2, was leptoprosopic, long- or narrow-faced. The gnathic index, computed by FLOWER's method, was found in the same skull to be 93.4, orthognathous. The canine fossæ were well marked. The nasio-malar index ranged from 105.2 to 107.5, the mean was 106.1, practically platyopic or flat-faced. The fronto-malar border of the orbit was not thickened. Except in one skull the infraorbital suture was obliterated. The intraorbital width ranged from 20 to 23 mm. The orbital index ranged from 87.5 to 89.7, and the mean was 89, three skulls were each megaseme. The hard palate was moderately arched. In one the torus palatinus medius was present, the maxillo-premaxillary suture was distinct, and the ovoid anterior palatine fossa was well marked, the palato-maxillary index, 132.5, was hyperbrachyuranic.

The cranial sutures were obliterated in the Tai Loi and the dental alveoli were nearly all absorbed; in the others the sutures were mostly denticulated, but in Mu Hso they were simple; in the Tame Wa those of the vault were partially fused, and the alveoli were partially absorbed. In Mu Hso small Wormian bones were situated at the junction of the lambda with the sagittal suture. The ali-sphenoido-parietal suture was usually broad, and Kwi had a small right epipteris. No third condyl was present in any specimen, and no paracondylar process, though in two the jugals were tuberculated, no pterygo-spinous process or foramen was seen; the occipital condyls were convex and were not partially divided by a groove on the surface. The dental alveoli were completely absorbed.

The glabello-occipital diameter ranged from 158 mm. in a female to 181 in the adult male, the mean in the four females was 168 mm. The greatest breadth ranged from 133 to 145 mm., the mean of the series was 137.8 mm. The cephalic index in the adults ranged from 77.3 to 82.4, and the mean was 81.2, brachycephalic. The basi-bregmatic height in four skulls ranged from 124 to 136 mm., and the mean was 130.7 mm.; in each skull the height was definitely less than the breadth; the vertical index ranged from 71.3 to 77.9, and the mean was 75.7, i.e. in the lower range of the hypsiccephalic group. The breadth-height index ranged from 92.1 to 97.8, and the mean was 94.2; in each case the index was distinctly below 100, so that they may be designated platychamacephalic, wide low skulls.\* The cranio-facial index in four skulls ranged from 70.3 to 74.7, and the mean was 72.9; in each the interzygomatic breadth was less than the parieto-squamous, and the cranio-facial index was therefore less than the cephalic. In three crania regarded as females the capacity ranged from 1120 to 1350 and the mean was 1296 c.c.; the male had a capacity 1400 c.c.

Of these skulls the male had the lowest cephalic index, 77.3, about the middle of the mesaticcephalic group; the females, on the other hand, were definitely brachycephalic in proportion and characters. The height was less than the breadth, a feature

\* See my memoir, "Craniology of People of Scotland," *Trans. Roy. Soc. Edin.*, vol. xl., part iii., 1903.

which prevails in brachycephalic people generally, and although not invariably found points to a brachycephalic type.

In Part I. of these memoirs on Indian Craniology, in which I described the skulls of a number of persons who had died in the prison at Insein, Burma, four, said to be Shans, are included in its Table VI. Of these, two were distinctly brachycephalic in proportions and form, with cephalic indices 80·6 and 80 respectively; one was in the higher term of the mesaticephalic group, 78·7, whilst only one, said to be from the South Shan States, was dolichocephalic, 74·0.

The evidence afforded by both series of skulls leads to the conclusion that the Shan States are inhabited, in some districts at least, by a brachycephalic people. The collection is too small to enable one to come to a more definite conclusion, and it is probable that a dolichocephalic race or races constitute a proportion of the population, especially in the hilly tracts. It is to be kept in mind that the Shan States are in close proximity to Western China and to Siam, in which brachycephalism prevails, and that they have affinities to these Mongolian people. I may refer on this point to the late Dr JOHN ANDERSON'S account of his journey in the Shan States,\* in which he described the Shans living in the valley as having the sallow tint of the Chinese, dark brown eyes, black hair, broad flat faces, prominent cheek-bones, and with some obliquity of the outer angle of the eyelids as in the Chinese.

#### TIBETANS. TABLE VIII.

In Part III. (1906) of my memoirs on Indian Craniology I described the skulls of two natives of Tibet† presented to me by Major C. N. C. WIMBERLEY, I.M.S. In a subsequent‡ memoir (1907) I described the skulls of two other Tibetans.

I have now cordially to acknowledge the receipt in 1908 of two additional skulls, which, like those described in 1907, were presented to me for the Anatomical Museum by Lieutenant F. M. BAILEY, who obtained them at Gyantse, Tibet, where he acted as British Agent. Of these skulls, No. 6 was apparently a male, said to be a Khamba, the other, smaller in dimensions, obviously a female, had no special mark on it. The lower jaw was absent in each case. In the male the wisdoms had not erupted and the basi-cranial joint was not ossified; in the female the wisdoms had erupted and the basi-cranial joint was almost closed. For convenience of reference the measurements of all the Tibetan skulls are included in Table VIII.

*Norma verticalis* (Nos. 6 and 7).—The cranial outline was ovoid; in the male the sagittal line was not raised; in the female it was somewhat elevated, though not ridged, and the slope from the suture to the parietal eminence was steeper in the female than in the male. The parieto-occipital slope was moderate, the occipital squama bulged somewhat more in the male than in the female. The male was cryptozygous, but in the

\* *Report on the Expedition to Western Yunan via Bhamo*, Calcutta, 1871.

† *Trans. Roy. Soc. Edin.*, vol. xlv., part ii., p. 288, 1906.

‡ *Idem*, vol. xlv., part iii., p. 812, 1907.



female the zygomata were just visible in this *normal*. Both were dolichocephalic, 73·7, 73·9. The breadth was greater than the height, and the mean vertical index was only 68·7.

TABLE VIII.—*Tibetans.*

Group KXIV., Sub-group A.

|                                    | Lhasa.                     | Kham,<br>East Tibet. | C.       | " D.     | Khamba.  |       |
|------------------------------------|----------------------------|----------------------|----------|----------|----------|-------|
| Collection number                  | 1.                         | 2                    | 3        | 4 *      | 6        | 7     |
| Age                                | Ad.                        | Ad.                  | Adolesc. | Metopic. | Adolesc. | Ad.   |
| Sex                                | M.                         | M.                   | M.       | M.       | M.       | F.    |
| Cubic capacity                     | 1520                       | 1430                 | 1570     | 1230     | 1540     | 1240  |
| Glabello-occipital length          | 179                        | 184                  | 186      | 178      | 186      | 176   |
| Basi-bregmatic height              | 132                        | 141                  | 140      | 100      | 130      | 119   |
| Vertical Index                     | 73·7                       | 76·6                 | 75·3     | 56·1     | 69·9     | 67·6  |
| Minimum frontal diameter           | 98                         | 96                   | 98       | 96       | 96       | 89    |
| Stephanic diameter                 | 122                        | 105                  | 105      | 108      | 110      | 100   |
| Asterionic diameter                | ...                        | 107                  | 103      | 120      | 100      | 104   |
| Greatest parieto-squamous breadth  | 142                        | 137                  | 135      | 141      | 137s.    | 130s. |
| Cephalic Index                     | 79·3                       | 74·5                 | 72·6     | 79·2     | 73·7     | 73·9  |
| Horizontal circumference           | 525                        | 515                  | 518      | 518      | 522      | 487   |
| Frontal longitudinal arc           | 136                        | 127                  | 125      | 132      | 128      | 120   |
| Parietal                           | 132                        | 138                  | 134      | 130      | 134      | 124   |
| Occipital                          | 114                        | 109                  | 120      | 111      | 115      | 109   |
| Total                              | 382                        | 374                  | 379      | 373      | 377      | 353   |
| Vertical transverse arc            | ...                        | 300                  | 305      | 281      | 304      | 275   |
| Basal transverse diameter          | ...                        | 124                  | 120      | 124      | 121      | 115   |
| Vertical transverse circumference  | ...                        | 424                  | 425      | 405      | 425      | 390   |
| Length of foramen magnum           | 34                         | 40                   | 40       | 31       | 39       | 34    |
| Basi-nasal length                  | 93                         | 100                  | 104      | 90       | 100      | 94    |
| Basi-alveolar length               | 93                         | 93                   | 105      | 104      | 94       | 93    |
| Gnathic Index                      | 100                        | 93                   | 101      | 115·6    | 94       | 98·9  |
| Total longitudinal circumference   | 509                        | 514                  | 523      | 494      | 516      | 481   |
| Interzygomatic breadth             | 135                        | 131                  | 136      | 130      | 127      | 120   |
| Intermalar                         | 121                        | 118                  | 127      | 117      | 116      | 108   |
| Nasio-mental length                | ...                        | 122                  | ...      | ...      | ...      | ...   |
| Nasio-mental complete facial Index | ...                        | 93·1                 | ...      | ...      | ...      | ...   |
| Nasio-alveolar length              | 75                         | 74                   | 74       | 65       | 65       | 66    |
| Maxillo-facial Index               | 55·5                       | 56·4                 | 54·3     | 50       | 51·1     | 55·5  |
| Nasal height                       | 53                         | 53                   | 54       | 52       | 50       | 46    |
| Nasal width                        | 26                         | 24                   | 28       | 27       | 25       | 23    |
| Nasal Index                        | 49·1                       | 45·3                 | 51·8     | 51·9     | 50       | 50    |
| Orbital width                      | 36                         | 38                   | 40       | 36       | 55       | 37    |
| Orbital height                     | 36                         | 37                   | 36       | 36       | 55       | 35    |
| Orbital Index                      | 100                        | 97·4                 | 90       | 100      | 100      | 94·6  |
| Palato-maxillary length            | 52                         | 53                   | 60       | 53       | 51       | 47    |
| Palato-maxillary breadth           | 62                         | 63                   | 67       | 56       | 62       | 56    |
| Palato-maxillary Index             | 119·2                      | 119                  | 111      | 105·6    | 121·5    | 119   |
| Nasio-malar Index                  | ...                        | ...                  | ...      | ...      | 105·2    | 104   |
| Cranio-facial Index                | 75·4                       | 71·2                 | 73·1     | 72·4     | 68·2     | 68·1  |
| Lower jaw.                         | Symphysial height          | ...                  | 30       | ...      | ...      | ...   |
|                                    | Coronoid                   | ...                  | 62       | ...      | ...      | ...   |
|                                    | Condylod                   | ...                  | 65       | ...      | ...      | ...   |
|                                    | Gonio-symphysial length    | ...                  | 86       | ...      | ...      | ...   |
|                                    | Inter-gonial width         | ...                  | 93       | ...      | ...      | ...   |
|                                    | Breadth of ascending ramus | ...                  | 37       | ...      | ...      | ...   |

\* No. 5 in the Museum Catalogue, also sent by Lieut. BAILEY from Gyantse, is only a skull-cap; it had probably formed the half of a praying drum. It was said to be a Khamba; from its length and breadth the skull to which it had belonged was probably dolichocephalic. See *Trans. Roy. Soc. Edin.*, vol. xlv. p. 815, 1907.

*Norma lateralis*.—The facial part of the frontal was almost vertical in No. 7 and receded slightly in No. 6; the frontal eminences were distinct, neither was metopic, the glabella and supraciliary ridges were scarcely marked, and there was no torus orbitalis; the supraorbital notches or foramina were distinct, and the frontal was flattened above the external orbital process. The nasion was not depressed. The bridge of the nose was low, its transverse outline was flattened and the profile had a very shallow concavity forwards. In each skull the parietal longitudinal arc was the longest, the occipital the shortest. The cranium rested behind on the cerebellar part of the occiput.

*Norma facialis*.—The height of the nose was about twice its width. Each lateral border of the anterior nares was a sharp crista prænasalis. In the female it marked off the floor of the nose from the incisive region and ended in a moderate maxillo-nasal spine; a narrow, shallow fossa prænasalis was behind the crest and was bounded behind by the margo infranasalis, which also reached that spine. In the male the crista prænasalis was lost below in the incisive region, so that the latter blended with the floor of the nose and the fossa prænasalis was indistinct. The nasal index, 50, was mesorhine. The maxillo-facial index in both was leptoprosopic. The orbits were high and rounded and the index was megaseme. The hard palate was well arched and the palato-maxillary index was brachyuranic. The nasio-malar index was 105.2 and 104 respectively, platyopic. The cranio-facial index was 68.2 and 68.1 respectively.

In the female the cranial sutures, relatively simple, were well marked; in the male they were simple and distinct, except that the sagittal was obliterated save in the area of the former anterior fontanelle; the parietal eminences were distinct, the parietal breadth was considerable, and as there was no scaphocephaly the disappearance of the sagittal suture could not have taken place before birth or in early infancy. No epipteries, no Wormian bones except a small one in the occipito-mastoid suture. The under surface of the jugal process was tuberculated, but there was no third condyl, nor pterygo-spinous foramen, although one external pterygoid was expanded, and directed backwards.

In the five male crania the capacity ranged from 1230 to 1570 c.c., with a mean 1458, and three exceeded 1500, which is a high average, almost like that found in Europeans. In the female skull the capacity was 1240 c.c.

As the measurements and indices of the skulls Nos. 6 and 7 are given in Table VIII., along with those of the four Tibetan skulls described in my previous memoirs, a comparison can readily be made of the characters of the six Tibetan crania in the Anatomical Museum of the University. One of the skulls (No. 1) was from Lhasa, its form and proportions were essentially brachycephalic, and the cephalic index was 79.3. Another (No. 4), with index 79.2, had a remarkable development of Wormian bones in the lambdoid and squamous sutures, which had probably modified the relations of length and breadth, whilst the height was affected by the unusual upward slope of the basi-occipital.

When the Lhasa skull and No. 4 are excluded, the cephalic index in the others was

below 75, and both in general characters and the proportions of length and breadth their crania were dolichocephalic. Of these, one (No. 2) was marked by Lt.-Colonel WIMBERLEY as that of a Kham warrior; No. 6 was marked Khamba or Kham, whilst Nos. 3 and 7 were so like in characters to the Khambas that they were doubtless of the same race.

The Lhasa skull was regarded as that of a typical inhabitant of that city and of characteristically Mongolian type. The Kham warrior skull (No. 2) was described in my first memoir as from the Kham province in the east of Tibet, where the people are dolichocephalic. No. 6, marked Khamba, a name which is without doubt synonymous with Kham, is also dolichocephalic; in No. 3, as in the Kham warrior, the height was more than the breadth and the cranium was hypsistenocephalic.

The group of six skulls included in Table VIII. furnish additional proof to that provided in my previous description, that in Tibet a dolichocephalic race exists in addition to the brachycephalic Mongolian race, the latter of which constitutes probably the main stock of the people of the great Upland Valley of Tibet, who form perhaps a large proportion of the inhabitants of the Buddhist monasteries; whilst the Khams, the warrior or fighting race, are derived from the Kham province situated in the east of Tibet.

#### EXPLANATION OF PLATES.

The Plates and Figures are numbered in sequence with those of Parts I.-III. of this series of Memoirs. The skulls were photographed by Mr ERNEST J. HENDERSON, and the process blocks were made by DAVID STEVENSON & Co.

##### PLATE XII.

Fig. 65. Profile of Bhil skull, XXI., B. 9.

„ 66. Vertex of same. „ „

Fig. 67. Face of Bhil skull, XXI., B. 9.

„ 68. Face of Chinbök, XXI., F. 21.

##### PLATE XIII.

Fig. 69. Profile of Chinbök, XXI., F. 21.

„ 70. Vertex of same. „ „

Fig. 71. Profile of Taungtha, XXI., F. 22.

„ 72. Profile of Yaw, XXI., F. 24.

##### PLATE XIV.

Fig. 73. Vertex of Yaw, XXI., F. 24.

„ 74. Face of same „ „

Fig. 75. Profile of Tame Wa, XXI., L. 1.

„ 76. Vertex of Akha, XXI., L. 5.

#### FIGURES IN TEXT.

Fig. 77. Contour tracing of Bhil, No. 8.

„ 78. „ „ of Bhil, No. 7.

„ 79. „ „ of Gond, D. 4.

„ 80. Section, skull of Kol.

„ 81. „ „ of Munda.

Fig. 82. Section, skull of Turí.

„ 83. „ „ of Pahariya.

„ 84. „ „ of Bhoomiz, Santal.

„ 85. „ „ of Juang.

„ 86. Contour tracing, Tamil Sudra, H. 8.

Figs. 76 to 81 are of skulls described in Part II. of my Memoirs on Indian Craniology.

SIR WILLIAM TURNER ON "Craniaology of the People of India." Part IV. — PLATE XII.



FIG. 65. Bhil.



FIG. 67.—Bhil.



FIG. 66.—Bhil.



FIG. 68.—Chinbók.



Sir WILLIAM TURNER ON "Craniology of the People of India." Part IV.—PLATE XIII.



FIG. 72.—Yaw.



FIG. 69.—Chinbók.



FIG. 71.—Taungtha.



FIG. 70.—Chinbók.



SIR WILLIAM TURNER on "Craniaology of the People of India." PART IV.—PLATE XIV.



FIG. 73.—Yaw.



FIG. 74.—Yaw.

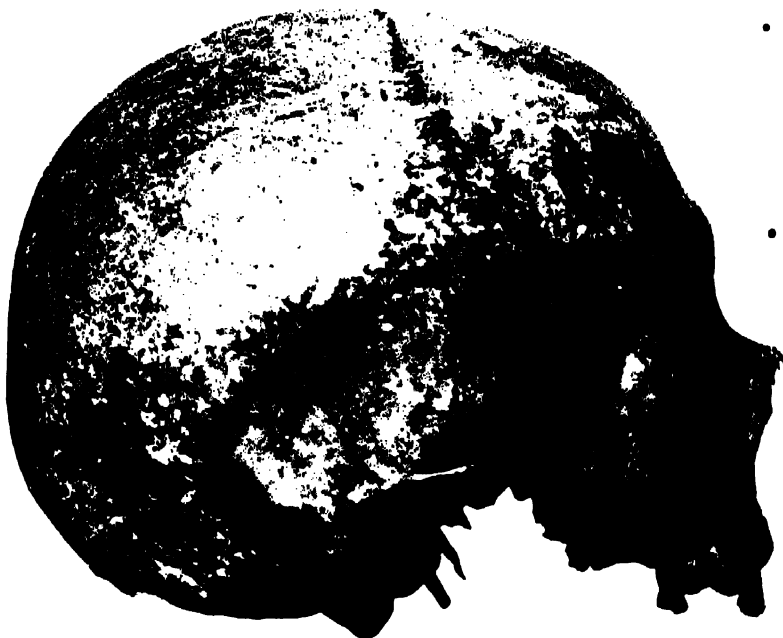


FIG. 75.—Tame Wa.



FIG. 76.—Akha.





**TRANSACTIONS**  
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**A CONTRIBUTION TO THE CRANIOLOGY OF THE  
NATIVES OF BORNEO, THE MALAYS,  
THE NATIVES OF FORMOSA, AND THE TIBETANS.**

**BY**

**PRINCIPAL SIR WILLIAM TURNER, K.C.B., D.C.L., F.R.S.**

**[WITH FIVE PLATES.]**

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XXVIII.—A Contribution to the Craniology of the Natives of Borneo, the Malays, the Natives of Formosa, and the Tibetans. By Principal Sir William Turner, K.C.B., D.C.L., F.R.S. (With Five Plates.)

(Read 10th June 1907. Issued separately July 20, 1907.)

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In three memoirs published from time to time in the *Transactions* of this Society\* I have described the characters of the crania in several Asiatic races, the bulk of which were natives of India, though a few were from countries adjoining Hindostan. In this memoir I intend to continue my inquiries into the cranial characters of Asiatic people, and to give an account of natives of Borneo, the Malays, the natives of Formosa, and the Tibetans.

BORNEO.

Through the courtesy of a former pupil, Dr ROBERT E. ADAMSON, I received between the years 1898 and 1901 fifteen skulls of natives of North Borneo. They were carefully labelled by him with the name of the tribe, and in many specimens also with that of the district from which they had been obtained. Ten skulls were discoloured with smoke, and several retained fragments of dried skin attached to the bones. They had been suspended in the houses of the natives by split cane, which in some specimens had been wound around the skull, so as to enclose it in an open cage with a long loop for suspension; in one skull the loop had been passed through the nose; in two others through a hole artificially made in the sagittal suture. Obviously these skulls had been trophies collected by the head hunters. In several, a part of the occipital bone bounding the foramen magnum had been removed, so as more readily to extract the brain.

In the following description the skulls are arranged in groups in accordance with the tribes to which they belonged.

\* Part I., Hill Tribes of the North-East Frontier of India and the People of Burma, *Trans. Roy. Soc. Edin.*, vol. xxxix., 1899; Part II., Aborigines of Chûta Nagpûr, the Central Provinces, Orissa, Veddahs, Negritos, *Transactions*, vol. xl., 1901; Part III., Natives of Madras Presidency, Thugs, Veddahs, Tibetans, Seistanis, *Transactions*, vol. xlv., 1906.

The names of the tribes, their geographical distribution in North Borneo and Sarawak, and the external physical characters of the people have been obtained from the following authorities:—MM. DE QUATREFAGES and HAMY, "*Crania Ethnica*," 1882; HENRY LING ROTH, "*The Natives of Sarawak and British North Borneo*," 1896, which contains an admirable résumé of the writings of travellers and British residents up to the date of publication, as well as a list of the tribes in Borneo, p. 37, prepared by Mr CHARLES HOSE; Sir HUGH LOW, "*Sarawak: its Inhabitants and Productions*," 1848; CARL BOCK, "*The Head Hunters of Borneo*," 1881, a narrative of travel in the south-east of the island; ALFRED C. HADDON, who travelled in the interior of Sarawak, "*Head Hunters, Black, White and Brown*," 1901; SPENCER ST JOHN, "*Wild Tribes of the North-West Coast of Borneo*," in which Land and Sea Dyaks are described (*Trans. Ethnol. Soc. Lond.*, vol. ii. p. 232, 1863); LIEUT. C. DE CRÉSPIGNY, R.N., "*On Northern Borneo*" (*Proc. Roy. Geogr. Soc.*, vol. xvi. p. 171, 1872); F. W. BURBIDGE, A. MART EVERITT, F. R. O. MAXWELL, F. WITTE, quoted by LING ROTH. C. HOSE, "*Natives of Borneo*," describes the people of the Baram district, North Sarawak (*Journ. Anth. Inst.*, vol. xxiii. p. 156, 1894); C. HOSE and W. McDUGALL, "*The Relations between Men and Animals in Sarawak*" (*Journ. Anth. Inst.*, vol. xxxi. p. 173, 1901); C. HOSE and R. SHEPHERD, "*Materials for a Study of Tatu in Borneo*" (*Journ. Anth. Inst.*, vol. xxxvi. p. 60, 1906).

#### MURUTS. TABLE I. PLATES I., V.

The Muruts are essentially an inland tribe in Borneo, occupying a district which extends from the Limbang river in Sarawak as far to the north as Mount Kinabalu, 13,700 feet high, in North Borneo. They inhabit the basins of the Padas and the Pagalan rivers, and they constitute an important element in the population of the western part of North Borneo.

The Muruts have a light brown or bronzed skin, which is in part tattooed; the hair is jet black, long, and frequently tied in a knot at the back of the head; the nose is flattened and the stature is said to be low. They pluck out the eyebrows and eyelashes, and during mastication and betel chewing they grind the teeth to the level of the gums. Their clothing is often limited to a loin cloth formed of bark. They live in long houses, are filthy in their habits, indulge freely in intoxicating drinks, and are lethargic in mind and body. They were inveterate head hunters, and the heads suspended in their houses became blackened with smoke. The killing of people for the sake of the heads is being repressed, under the British administration.

Five of the skulls were labelled Murut. In Table I. they are lettered A to E inclusive. A to D were adults. In E the basi-cranial synchondrosis was not ossified, the wisdom teeth were concealed in the bone, but the other permanent teeth were erupted, and the age was probably from 18 to 20. D and E were apparently females, and in each the occipital squama had been in part removed. B, C and E retained the lower jaw.

*Norma verticalis*.—The cranium in A, B, C and E was elongated, ovoid, and characteristically dolichocephalic in form and proportion; the cephalic index was in each below 75, and in C as low as 69.9. In D, again, the cranial outline was more broadly ovoid, and the cephalic index was 77.7, *i.e.* in the mid-term of the mesaticephalic group. The crania were not ridged in the sagittal line, the parietal eminences were moderate, and the slope of the vault outwards varied in the degree of steepness. Except in D the squamous region was not bulging, and in B and E the greatest breadth was in the

parietal region. The parieto-occipital slope was moderate, the occipital squama projected behind the inion, and there was no artificial flattening. Four were cryptozygous, one phænozygous.

*Norma lateralis*.—The forehead slightly receded in the male and approached the vertical in the female skulls. The glabella and supraorbital ridges were not prominent and were distinct from the outer upper orbital border, and the frontal bone was flattened in the area between that border and the temporal ridge. The nasion was not depressed except in E, the nasal bridge was not keeled, and tended to be flattened, though with a shallow upward concavity. The occipital arc was the shortest in all the specimens, and, with one exception, the frontal exceeded the parietal arc, though in two only by 1 mm. The crania rested behind on the cerebellar fossæ.

*Norma facialis*.—In A and C the floor of the nose was separated from the incisive region by a sharp ridge, but in the others the ridge was smoothed down. In all the maxillo-nasal spine was distinct. In B the nares were narrow, the nasal height was more than double the width, and the nasal index was leptorhine; in the others they were wider both absolutely and relatively to the height of the nose, so that the index in A and C was mesorhine and in D and E platyrhine, but the mean index of the series, 50·5, was mesorhine. In B the complete face was long and the index was leptoprosopic, in C it was low and the index was chamaeprosopic, but in four skulls the mean maxillo-facial index, 51·2, was leptoprosopic.\* In A, B, D the upper jaw was orthognathous, in C feebly mesognathous, and the mean gnathic index computed by FLOWER's method was 94·2. The relation of the bi-malar to the nasio-malar diameter gave a nasio-malar index † which ranged from 108·4 to 111·4, and the mean, 110, was mesopic and indicated a nose not specially flattened at the root. In A, C, D, E the orbital aperture was rounded, and the mean index, 94·4, was megaseme, in B the breadth was relatively greater, and the index, 87·2, was mesoseme. The hard palate was shallow in A, D, E, and more arched in B and C. In three skulls the palato-maxillary index was hyperbrachyuranic, in one brachyuranic. The teeth, with few exceptions, had been lost; those that remained were betel-stained and worn by use, but not to the level of the gums. The lower jaw had a square projecting chin, the angle was well marked and the muscular ridges were distinct.

The cranial sutures were moderately denticulated. In E the sagittal was closed, but the cranium was not scaphocephalic. A few small Wormian bones were present, though

\* In my memoir on the Craniology of the People of Scotland (*Trans. Roy. Soc. Edin.*, 1903), I have explained KOLLMANN's plan of obtaining facial indices, and have suggested a modification in the grouping as follows:—

|                                       | Complete facial index. | Maxillo-facial index. |
|---------------------------------------|------------------------|-----------------------|
| Leptoprosopic, narrow face, . . . . . | 90·1 and upwards       | 50·1 and upwards      |
| Mesoprosopic, . . . . .               | 85 to 90               | 45 to 50              |
| Chamaeprosopic, low face, . . . . .   | below 85               | below 45              |

† See OLDFIELD THOMAS in *Journ. Anth. Inst.*, vol. xiv. p. 332, 1885. My suggested modification of the divisions of the nasio-malar index is: *platyopic*, low flat-faced profile, index below 106; *pro-opic*, projecting profile, index above 110; profile intermediate in degree, *mesopic*, from 106 to 110 (*Trans. Roy. Soc. Edin.*, vol. xlv. p. 263, 1906).

D had a left epipteris; the alisphenoid articulated freely with the parietal. The mastoids,inion and curved lines were moderate. C had a smooth surface on the left jugal process which had probably articulated with the transverse part of the atlas; there was no 3rd condyl.

The mean cephalic index of the five Murut skulls was 73·9, and if the mesaticephalic D be excluded, only 72·9; in both instances the mean index was dolichocephalic. The mean vertical index in four specimens was 75, metriocephalic. The mean glabella-occipital length was 179·2 mm.; the mean greatest breadth 132·4 mm.; the mean basi-bregmatic height 134·2 mm. As regards the relations of the breadth to the height of the cranium, in only one skull did the breadth exceed the height, and the mean breadth-height index of the four specimens was 100·97; the crania belonged therefore to the group to which I have extended the name *hypsisenocephalic*,\* to include skulls in which the index exceeds 100.

The three male crania ranged in internal capacity from 1300 c.c. to 1430 c.c., and the mean was 1370 c.c.; in the female E the capacity was 1330 c.c., whilst in D, the sex of which was doubtful, it was 1430 c.c.†

#### DUSUNS. TABLE I. PLATE I.

The name Dusun is given to a tribe in Borneo which occupies the interior of the island from its northern end to as far south as the Dutch territory. Their country is to the north and east of the Muruts, and the Sulus intervene between them and the eastern sea-coast. They are well built; muscular and active. The skin is a light, clear brown, fairer than the Malays of the coast; the hair is black, and is worn by the men hanging down over the shoulders; the eyes also are black. BURBIDGE says that some have well-cut features, though the Mongolian type of face prevails; the nose is flattened at the root and the nostrils are wide. The teeth are filed and blackened, and the skin is tattooed. The usual stature is 5 feet 4 or 6 inches. The Dusuns are by some authorities considered to possess a strain of Chinese blood, and are less given to head hunting than some of the other tribes. By some authorities the name *Ida'an* is applied to the Dusuns.

Three skulls presented by Dr ADAMSON were labelled Dusun, and of these F was further designated Tegahas, a tribe which lives in the hilly country in the interior; G was from the Kinarut district in north-west Borneo; H, Dusun Dyak, Si Labandang, of Ulu Papar, near the source of the river Papar. They were male adults; G and H retained the lower jaw, and in G a large part of the two parietals and of the occipital squama had been apparently sliced off by a sharp weapon. The skulls were not uniform in character. H was much larger and more massive than the others; and

\* See my memoir on Scottish Crania, *op. cit.*, vol. xl, pp. 598, 599, 1903, for explanation of the terms metriocephalic and *hypsisenocephalic*.

† The cranial capacity in this as in my previous memoirs was taken by the method employed and described in my *Challenger Report*, Zoology, part xxix, p. 9, 1884, the accuracy of which has been confirmed since that time by repeated investigations.

### TABLE I.

*North Borneo.*

|                                     | Muruts. |       |        |       |        | Dusun.   |          |            | Dalit. | Kweejow. |        |
|-------------------------------------|---------|-------|--------|-------|--------|----------|----------|------------|--------|----------|--------|
|                                     | A.      | B.    | C.     | D.    | E.     | Tegahas. | Kinarut. | Ulu Papar. | I.     | L.       | K.     |
| Collection mark,                    | Ad.     | Ad.   | Ad.    | Ad.   | Ad.    | Ad.      | Ad.      | Ad.        | Ad.    | Ad.      | Youth. |
| Age,                                | M.      | M.    | M.     | M.    | M.     | M.       | M.       | M.         | M.     | M.       | ...    |
| Sex,                                |         |       |        |       |        |          |          |            |        |          | ...    |
| Cubic capacity,                     | 1380    | 1800  | 1430   | 1430  | 1330   | 1270     | ...      | 1570       | 1360   | 1435     | 1330   |
| Glabello-occipital length,          | 180     | 178   | 183    | 175   | 180ap. | 173      | 180ap.   | 187        | 177    | 180      | 177    |
| Basi-bregmatic height,              | 135     | 133   | 136    | 133   | ...    | 121      | 135      | 138        | 138    | 144      | 131    |
| Vertical Index,                     | 75      | 74.7  | 74.3   | 76    | ...    | 69.9     | 75       | 73.8       | 78     | 80       | 74     |
| Minimum frontal diameter,           | 91      | 90    | 88     | 88    | 90     | 86       | 91       | 97         | 96     | 96       | 85     |
| Stephanic diameter,                 | 96      | 105   | 103    | 105   | 103    | 97       | 98       | 112        | 107    | 104      | 98     |
| Asterionic diameter,                | 105     | 107   | 104    | 110   | 98     | 118      | 105      | 110        | 109    | 118      | 96     |
| Greatest parieto-squamous breadth,  | 133s.   | 133p. | 128s.  | 136s. | 132p.  | 135s.    | 130      | 141        | 136s.  | 141      | 129p.  |
| Cephalic Index,                     | 73.9    | 74.7  | 69.9   | 77.7  | 73.3   | 78       | 72.2ap.  | 75.4       | 76.8   | 78.3     | 72.9   |
| Horizontal circumference,           | 505     | 508   | 508    | 505   | 505    | 499      | 502      | 529        | 508    | 516      | 498    |
| Frontal longitudinal arc,           | 128     | 128   | 132    | 126   | 130    | 121      | 130      | 125        | 127    | 129      | 127    |
| Parietal " " "                      | 127     | 127   | 129    | 131   | 125    | 133      | ...      | 128        | 135    | 122      | 131    |
| Occipital " " "                     | 114     | 105   | 109    | 115   | 106    | 102      | ...      | 139        | ...    | ...      | ...    |
| Total " " "                         | 369     | 360   | 370    | 375   | 361    | 358      | ...      | 392        | ...    | ...      | ...    |
| Vertical transverse arc,            | 295     | 290   | 296    | 301   | 280    | 285      | 285      | 317        | 309    | 313      | 300    |
| Basal transverse diameter,          | 121     | 118   | 121    | 121   | 113    | 114      | 123      | 124        | 125    | 120      | 109    |
| Vertical transverse circumference,  | 416     | 408   | 417    | 422   | 393    | 399      | 408      | 441        | ...    | 433      | 409    |
| Length of foramen magnum,           | 38      | 37    | 37     | 36    | ...    | 33       | 33       | 33         | ...    | ...      | ...    |
| Basi-nasal length,                  | 101     | 100   | 104    | 94    | ...    | 90       | 102      | 100        | 100    | 97       | ...    |
| Basi-alveolar length,               | 94      | 90    | 102    | 90    | ...    | 91       | 97       | 94         | 96ap.  | 92       | ...    |
| Gnathic Index,                      | 93.1    | 90    | 98.1   | 95.7  | ...    | 101.1    | 95.1     | 94         | 96ap.  | 94.8ap.  | ...    |
| Total longitudinal circumference,   | 508     | 497   | 511    | 505   | ...    | 481      | ...      | 525        | ...    | ...      | ...    |
| Interzygomatic breadth,             | 127     | 128   | 131    | 127   | ...    | 127      | 132      | 133        | 139    | 129      | 119    |
| Intermalar " "                      | 117     | 118   | 117    | 115   | ...    | 113      | 117      | 124        | 128    | 123      | 105    |
| Nasio-mental length,                | ...     | 117   | 106ap. | ...   | 114    | ...      | 110      | 111        | ...    | ...      | ...    |
| Nasio-mental complete facial Index, | ...     | 91.4  | 80.9   | ...   | ...    | ...      | 83.3     | 83.4       | ...    | ...      | ...    |
| Nasio-alveolar length,              | 64      | 65    | 68     | 66    | 63     | 62       | 64       | 65         | 66ap.  | 59       | 61     |
| Maxillo-facial Index,               | 50.4    | 50.7  | 51.9   | 51.9  | ...    | 49.6     | 48.4     | 48.8       | 47.5   | 45.7     | 51.2   |
| Nasal height,                       | 52      | 54    | 53     | 50    | 49     | 50       | 54       | 50         | 52     | 46       | 45     |
| Nasal width,                        | 26      | 25    | 26     | 27    | 26     | 26       | 26       | 27         | 24     | 29       | 27     |
| Nasal Index,                        | 50      | 46.3  | 49.1   | 54    | 53.1   | 52       | 48.1     | 54         | 46     | 63       | 60     |
| Orbital width,                      | 37      | 39    | 36     | 34    | 37     | 38       | 37       | 37         | 40     | 40       | 33     |
| Orbital height,                     | 35      | 34    | 36     | 31    | 34     | 33       | 34       | 36         | 34     | 35       | 33     |
| Orbital Index,                      | 94.6    | 87.2  | 100    | 91.2  | 91.9   | 86.8     | 91.9     | 97.3       | 85     | 87.5     | 100    |
| Palato-maxillary length,            | 46      | 45    | 51     | 48    | ...    | 48ap.    | 57       | 50         | 49ap.  | ...      | ...    |
| Palato-maxillary breadth,           | 61      | 63    | 60     | 61    | 62     | 58       | 59       | 64         | 64     | ...      | ...    |
| Palato-maxillary Index,             | 132.6   | 140   | 117.6  | 127   | ...    | 120      | 103.5    | 128        | 130    | ...      | ...    |
| Nasio-malar Index,                  | 111.4   | 108.4 | 109.2  | 111.2 | ...    | 106.6    | 107.3    | 108.2      | 109    | 106      | 112.3  |
| Cranio-facial Index,                | 70.6    | 71.9  | 71.6   | 72.6  | ...    | 73.4     | 73.3     | 71.1       | 78.5   | 71.7     | 67.2   |
| Lower jaw.                          |         |       |        |       |        |          |          |            |        |          |        |
| Symphysial height,                  | ...     | 35    | 32     | ...   | 32     | ...      | 29       | 28         | ...    | ...      | ...    |
| Coronoid " "                        | ...     | 61    | 55     | ...   | 60     | ...      | 63       | 72         | ...    | ...      | ...    |
| Condylod " "                        | ...     | 59    | 56     | ...   | 58     | ...      | 58       | 69         | ...    | ...      | ...    |
| Gonio-symphysial length,            | ...     | 86    | 88     | ...   | 73     | ...      | 89       | 91         | ...    | ...      | ...    |
| Inter-gonial width,                 | ...     | 106   | ...    | ...   | 94     | ...      | 103      | 97         | ...    | ...      | ...    |
| Breadth of ascending ramus,         | ...     | 30    | 36     | ...   | 33     | ...      | 44       | 35         | ...    | ...      | ...    |



whilst they were smoke-stained, it was not, and evidently had not been suspended in a hut. This man was an ambitious, turbulent native, who had been executed for rebellion.

*Norma verticalis.*—The cranial outline in H was elongated, somewhat broadly ovoid, the form was dolichocephalic, but the cephalic index, 75·4, slightly exceeded the upper numerical limit of that group. The sagittal line was slightly raised, the vault had a steepish slope downwards to the moderate parietal eminences, below which the side walls were almost vertical. The occipital squama projected behind theinion.

The Tegahas skull was smaller, but the relative breadth was greater, the cranial outline showed a wider ovoid, and the cephalic index, 78, placed the skull in the higher term of the mesaticephali. G, again, was so injured that the form of the vault could not be seen; the length and breadth could only be stated approximately, but the cephalic index was obviously below 75. G was phænozygous, and H and F were cryptozygous.

*Norma lateralis.*—In all these crania the forehead slightly receded, the glabella and supraorbitals were moderate and distinct from the outer upper orbital borders, above which the frontal was flattened towards the temporal ridge; the nasion was a little depressed, the nasal bridge was not keeled, tended to be flattened from side to side and slightly concave upwards. The nasal bones were well formed, and in H were mesially 27 mm. long. In F and H the parietal arc was longer than the frontal, but in H the occipital arc was the longest, 139 mm., owing to the occipital squama, which was not quite symmetrical, being 105 mm. in its longitudinal diameter. The crania F and G rested behind on the cerebellar fossæ, but in H on the tips of the mastoids.

*Norma facialis.*—In H a low but smooth ridge separated the floor of the nose from the incisive region; in F and G it was smoothed down and one region was continued into the other; in F the maxillo-nasal spine was faint, in G and H a little stronger. The anterior nares were almost alike in width, and the mean nasal index, 51·3, was mesorhine, though in H, owing to the smaller proportion of nasal height to width, the index was platyrrhine: the nasio-malar index ranged from 106·6 to 108·2, and the mean, 107·3, was mesopic.

The face in G and H was low, and the complete index was chamæprosopic, but owing to the nasio-alveolar length the maxillo-facial index was leptoprosopic. The mean gnathic index, computed on the relation of the basi-nasal and basi-alveolar diameters, was 96·7, i.e. orthognathous; but in F the incisive part of the upper jaw projected forward, and the index, 101·1, was mesognathous. The interorbital diameter was 23 mm. The orbital aperture was rounded, megaseme, in G and H, but in F the index, 86·8, was mesoseme. The palate had a moderate depth; in F and H the index was brachyuranic, in G hyperdolichuranic. The teeth when present were worn and stained with betel. In the jaws the alveoli were not absorbed; the angles, chins, and muscular markings were distinct in the lower jaws.

The cranial sutures were simple, sutural bones in the lambdoid region were small and sparse, pterion normal. In G and H the styloids were fused with the temporals.

The mean cephalic index in the Dusuns was 75·2 mesaticephalic, and F was in the upper term of that group. The mean basi-bregmatic index was 72·9, metriocephalic. The general dimensions were as follows:—mean length 180 mm., height 131 mm., breadth 135 mm.; the breadth was therefore greater than the height, a character which is usually associated with mesaticephalic and brachycephalic crania. The mean breadth-height index was 97, for in the Tegahas skull the height was only 121 mm. The cranial capacity could be taken only in F and H, which showed great diversity, for F was only 1270 c.c., whilst H, 1570, was above the mean of male Europeans, and was associated with the large cranium and the mental capacity of the individual.

DALIT. TABLE I.

In Dr ADAMSON'S collection was an adult male skull of a tribe living in the Dalit country, which he stated to be in the interior of North Borneo, bordering on Dutch territory. The skull was smoke-stained and had attached to it a loop of split cane for suspension. The lower jaw was absent.

Lieutenant DE CRESPIGNY, R.N., in his memoir on Northern Borneo, published a vocabulary of the Dali Dusun tribe living near the Limbang river, to a member of which tribe this skull may have belonged. There appears indeed to be an association between the Dalits and the Dusuns, as Mr WIRTH states that many words probably of Dalit origin occur in Dusun speech. South of the Limbang, in the Baram district of Sarawak, is the well-known Mount Dulit, a name which may be associated with the Dalit branch spoken of as Mount Dulit Dusuns.

*Norma verticalis*.—The cranium was elongated, but owing to the relative breadth the cephalic index, 76·8, placed the skull in the lower term of the mesaticephalic group. The sagittal line was somewhat ridged and the vault sloped steeply down to the parietal eminences, below which the side walls were almost vertical. The parieto-occipital curve was steep and the occipital squama scarcely projected behind a feeble inion. The skull was phænozygous.

*Norma lateralis*.—The forehead was slightly receding, the glabella and supra-orbital ridges were moderate in size, the frontal was flattened above the external orbital process, and the outer border of the orbit was thickened; the nasion was not depressed, the bridge of the nose was low, tended to be flattened from side to side, and was 25 mm. long in the middle line. The parietal arc was longer than the frontal; the occipital condyls, cerebellar region and mastoids had been injured.

*Norma facialis*.—A low ridge separated the floor of the nose from the incisive region, the maxillo-nasal spine was moderate. The anterior nares were narrow, and the nasal index, 46, was leptorhine. The nasio-malar index was 109, and therefore mesopic. The canine fossæ were deep. The maxillo-facial index, 47·5, was mesoprosopic, and the interzygomatic breadth was 139 mm. The upper jaw was broken in the incisive region, and the gnathic index was possibly orthognathous. The orbital aperture was

mesoseme, index 85; the interorbital breadth was 23 mm. The hard palate was wide and shallow, and the palato-maxillary index was hyperbrachyuranic; none of the alveoli contained teeth.

The cranial sutures were mostly simple, and those of the vault were undergoing ossification; they had no Wormian bones, and the pterion was normal. The vertical index, 78, was more than the cephalic, and in the height being greater than the breadth the cranium was associated with a character customary in dolichocephalic skulls, and the skull in its breadth-height index, 101.4, was hypsistenocephalic. The internal capacity of the cranium was 1360 c.c.

#### KWEEJOW. TABLE I. PLATE III.

Dr ADAMSON informed me that the tribe which he calls Kweejow or Kijow is found in the interior of North Borneo. He stated that they live on the hills, and that their language differs from that of the other tribes in proximity to them. Obviously little is known of these people, as the name does not occur in Mr LING ROTH's admirable compendium of information on the natives of Sarawak and North Borneo, in Mr C. HOSE's memoirs, or in Mr HADDON's work on Head Hunters. In Lieutenant DE CRESPIGNY's memoir already quoted is a passage which without doubt refers to this tribe. He says, p. 176, on the Kalias river, near Padas,\* live a tribe of people called Kōijoes. They differ much in their habits from the neighbouring tribes, and more especially in their food, for where, as among the Muruts and Dusuns, a certain discrimination is exercised in the choice of food, nothing comes amiss to the Kōijoes—snakes, worms, and beetles are eaten by them as a matter of course. I received two skulls marked Kweejow; one an adult male without the lower jaw, which weighed 1 lb. 12 ozs. avoirdupois. It was stained deep brown from adherent soot. The other, smoke-stained and without the lower jaw, was that of a youth with the dentition incomplete and the basi-cranial synchondrosis unossified.

Skull L. *Norma verticalis*.—The adult male cranium was broadly ovoid in outline, with a cephalic index 78.3. The vault was not ridged in the sagittal line, and curved at first gently, then more steeply outwards to feeble parietal eminences, below which the side walls were a little convex. The parieto-occipital slope was not steep, and the occipital squama projected much beyond a feeble inion. The skull was phænozygous.

*Norma lateralis*.—The forehead was receding; the glabella and supraorbital ridges were well-marked and blended with the thickened superior border of the orbit. The nasion was depressed, the nasal bones were short, only 18 mm. long in the mid-line, and did not form a keel, so that the root of the nose was flattened from side to side and the profile outline was concave from above downwards. The frontal arc was 7 mm. longer than the parietal. The skull rested behind on the cerebellar part of the occipital bone, which was broken at the foramen magnum.

\* The Kalias and Padas rivers are in the western part of North Borneo.

*Norma facialis*.—A low smooth border separated the floor of the nose from the incisive region, the maxillo-nasal spine was moderate. The anterior nares were wide and the nasal length was small, so that the index, 63, was highly platyrrhine. The nasio-malar index in the adult was 106, on the line between platy- and mesopic. The maxillo-facial index, 45·7, was mesoprosopic. The alveolar border of the upper jaw was broken and the index was possibly orthognathous. The upper and outer borders of the orbit were thick; the aperture, 87·5, was mesoseme. The hard palate was wide and shallow, all the teeth had been lost. The projection of the glabella and supra-orbital ridges, the depressed nasion, the short nose and wide nostrils gave to the face a forbidding aspect.

The cranial sutures were simple and to a large extent ossified. No Wormian bones were observed, but a large left epipteris was present. The cephalic index, 78·3, was in the higher term of the mesaticephalic group, the height of the cranium was greater than the breadth, the vertical index of the skull, 80, was hypsicephalic. The internal capacity of the cranium was 1435 c.c.

Skull K.—The youth's skull differed materially from that of the adult. It was definitely dolichocephalic, with the cephalic index 72·9, and the height was more than the breadth; the nasio-malar index, 112·3, was prosopic. Although the dentition was incomplete, the face was actually longer than in the skull of the adult, and the maxillo-facial index, 51·2, was leptoprosopic; the orbit was rounded with a megaseme index, 100, and the nasal index, 60, as in the adult, was platyrrhine. The skull was smoke-stained, and had doubtless been suspended in a house as a war trophy, for the head-hunting tribes do not scruple to make victims of women and children; possibly the skull was not a Kweejow, but had belonged to a neighbouring dolichocephalic tribe. The cranial capacity was 1330 c.c.

#### DAYAKS.

The term Dyak is sometimes incorrectly used by travellers to designate generally the wild people of Borneo. Mr EVERETT contends that it should only be applied to the tribes who themselves use it as their distinctive appellation. In this sense it seems to be employed by the resident officials in Sarawak and North Borneo. The late Sir JAMES BROOKE used the word as properly applicable to wild people "inhabiting parts of the north-western coasts and the mountains of the interior," and he divided them into two groups, Land Dyaks and Sea Dyaks. At one time the difference between them was regarded as one of circumstance only, and that they were essentially the same people. More recent inquiries have led to the belief that these groups differ from each other in many particulars.

## LAND DYAKS. TABLE II. PLATE II.

The Land Dayaks chiefly occupy the Sadong and Sarawak river districts and extend into Dutch Borneo. They are described as having the skin of a reddish or yellowish brown colour, the hair black and worn generally long, the eyes black, the nose flattened at the bridge and wide at the nostrils; the face broad; in stature the men range from 5 feet 2 inches to 5 feet 5 inches, rarely 5 feet 7 inches, whilst the women are from 4 feet 6 inches to 5 feet. They file the teeth, which are stained of a black colour. They are head hunters, and the heads are kept in houses specially built for their reception, in which the bachelors live.

Dr ADAMSON sent me the skull of an adult male Land Dayak from Sarawak, which was not smoke-stained and had no loops of cane attached to it. The lower jaw was absent.

*Norma verticalis*.—The skull was somewhat elongated in relation to the breadth, and the cephalic index, 76·3, was in the lower term of the mesaticcephali. The vault was a little ridged in the sagittal line and had a marked downward slope to the moderate parietal eminence, below which the side walls were almost vertical. The parieto-occipital slope was not abrupt and the occipital squama scarcely bulged behind the inion. The skull was phænozygous.

*Norma lateralis*.—The forehead receded slightly, the glabella and supraorbitals were moderate in projection, and the latter did not blend with the outer upper border of the orbit; the frontal was flattened above the external orbital process. The nasion was scarcely depressed. The parietal longitudinal arc was the longest, the occipital the shortest. The skull rested behind on the cerebellar region of the occipital bone.

*Norma facialis*.—The nasal floor was separated from the incisive region by a low ridge, the incisive and canine fossæ were deep, the maxillo-nasal spine was feeble. The anterior nares were moderately wide and the index, 49·1, was mesorhine. The mid-length of the nasal bones was 25 mm. The nasio-malar index was 106·1 and the face was mesopic. The maxillo-facial index, 52·4, showed a relatively narrow, leptoprosopic face, and the interzygomatic breadth was 132 mm. The upper jaw was orthognathous. The orbital aperture was round and the megaseme index was 100. The hard palate was shallow, the palato-maxillary index was hyperbrachyuranic. The teeth were slightly worn and not stained with betel.

The sutures of the cranial vault were simple and were to some extent obliterated. The right half of the occipital squama formed a large triquetral bone, partially fused with the rest of the squama. The pterion was normal. No special variations were seen at the base of the skull.

Although the cephalic index, 76·3, was in the lower term of the mesaticcephalic group, the general form of the cranium was dolichocephalic;\* the vertical index, 75·1, hypsi-cephalic, was less than the cephalic, and the breadth and height index was 98. The internal capacity of the cranium was 1230 c.c.

\* Mr HADDON states, *op. cit.*, p. 322, that the cephalic index of the skull of a Land Dyak in the Cambridge Museum was 71·3.

## SEA DYAKS. TABLE II. PLATE II.

The Sea Dyaks occupy Sarawak to the east of the Land Dyaks; they have settled on the banks of the Rejang, Kalakah, Saribas and Batang-Lupar rivers, with their tributaries, and they are found also in Dutch Borneo. Mr MAXWELL states that they are more stoutly built than the Land Dyaks. The skin is a rich brown, the hair is long, jet black and flowing; the eyes are black; the nose is short and upturned at the tip. The women are not so dark as the men and the skin has a yellowish tint. The average stature of the men is about 5 ft. 3 in., though occasionally it reaches 5 ft. 7 in. They exceed the Malays in height and have graceful figures. They file the teeth and stain them black. They are head hunters. Tattooing is not universally practised. Mr HADDON adopts the name Iban in substitution for Sea Dyak, and he gives the following physical characters:—average stature 5 ft. 2½ in.; broad head, average cephalic index 83; skin darker than among the inland tribes; long, slightly wavy, black hair, showing a reddish tinge in certain lights; the people, though short, are active.

The skull of an adult male Sea Dyak was in the collection made by Dr ADAMSON. It was not smoke-stained, nor was a loop of cane attached to it for purpose of suspension. It was injured in the left parietal and squamous regions, and the lower jaw had not been preserved.

*Norma verticalis*.—The cranium was broadly ovoid in outline, and the cephalic index, 78·5, was in the upper term of the mesaticephalic group. The vault was faintly keeled, and it sloped definitely down to the parietal eminences, below which the side walls bulged a little. The parieto-occipital slope was steep, though not vertical, and it was oblique to the left, probably from artificial flattening. The skull was phænozygous.

*Norma lateralis*.—The forehead was somewhat retreating; the glabella and supra-orbitals were well marked; the outer part of the upper border of the orbit was thickened but distinct from the supraorbital process, and the corresponding part of the frontal bone was flattened. The nasion was slightly depressed; the bridge of the nose was broken, but obviously had only slightly projected, and had been somewhat flattened from side to side. The frontal longitudinal arc was the longest, the occipital was the shortest. The skull rested behind on the mastoids.

*Norma facialis*.—The floor of the nose was separated from the incisive region by a low ridge; the maxillo-nasal spine was short. The anterior nares were relatively wide, and the nasal index, 50·9, was mesorhine. The canine and incisive fossæ were moderately deep. The nasio-malar index was 108·9 and mesopic. The maxillo-facial index, 51·8, was narrow or leptoprosopic, although the interzygomatic breadth, which gave width to the face, was 139 mm. The upper jaw showed alveolar prognathism and the gnathic index was highly mesognathous. The interorbital breadth was 26 mm., the orbital aperture was nearly equal in its two dimensions and the index was megaseme. The hard palate was moderate in depth and the palato-maxillary index, 116·3, was brachyuranic. The teeth had not been preserved.

TABLE II.

|   | Borneo.             |           |                      |        | Malays. |             |
|---|---------------------|-----------|----------------------|--------|---------|-------------|
|   | Land Dyak, Sarawak. | Sea Dyak. | Tali, Bajau, Brunei. | Bajau. | Perak.  | Challenger. |
| Collection mark,                            | O.                  | P.        | M.                   | N.     | P       | C.          |
| Age,  | Ad.                 | Ad.       | Ad.                  | Ad.    | Ad.     | Ad.         |
| Sex,  | M.                  | M.        | M.                   | M?     | M.      | M.          |
| Cubic capacity,                             | 1235                | ...       | 1350                 | 1180   | 1515    | 1515        |
| Glabello-occipital length,                  | 173                 | 172       | 164                  | 154    | 173     | 163         |
| Basi-bregmatic height,                      | 130                 | 140       | 137                  | 124    | 141     | 145         |
| <i>Vertical Index</i> ,                     | 75.1                | 81.4      | 83.5                 | 80.5   | 81.5    | 89.         |
| Minimum frontal diameter,                   | 93                  | 94        | 86                   | 92     | 94      | 96          |
| Stephanic diameter,                         | 95                  | 101       | 103                  | 92     | 113     | 121         |
| Asterionic diameter,                        | 118                 | 118       | 101                  | 103    | 106     | 107         |
| Greatest parieto-squamous breadth,          | 132s.               | 135s.     | 136p.                | 137s.  | 140     | 151         |
| <i>Cephalic Index</i> ,                     | 76.3                | 78.5      | 82.9                 | 89.    | 80.9    | 92.6        |
| Horizontal circumference,                   | 496                 | 496       | 478                  | 470    | 505     | 508         |
| Frontal longitudinal arc,                   | 116                 | 128       | 123                  | 111    | 126     | 127         |
| Parietal " " " "                            | 120                 | 124       | 129                  | 115    | 127     | 123         |
| Occipital, " " " "                          | 111                 | 103       | 109                  | 96     | 116     | 111         |
| Total, " " " "                              | 347                 | 355       | 361                  | 322    | 369     | 361         |
| Vertical transverse arc,                    | 284                 | 300       | 300                  | 287    | 312     | 330         |
| Basal transverse diameter,                  | 122                 | 130       | 115                  | 125    | 126     | 135         |
| Vertical transverse circumference,          | 406                 | 430       | 415                  | 412    | 438     | 468         |
| Length of foramen magnum,                   | 40                  | 37        | 37                   | 36     | 34      | 35          |
| Basi-nasal length,                          | 99                  | 102       | 96                   | 90     | 104     | 98          |
| Basi-alveolar length,                       | 90                  | 100       | 93                   | 92     | 104     | 92          |
| <i>Gnathic Index</i> ,                      | 90.9                | 98.       | 96.9                 | 102.2  | 100     | 93.8        |
| Total longitudinal circumference,           | 486                 | 494       | 494                  | 448    | 507     | 494         |
| Interzygomatic breadth,                     | 132                 | 139       | 123                  | 129    | 136     | 145         |
| Internalar,                                 | 121                 | 127       | 114                  | 114    | 126     | 128         |
| Nasio-mental length,                        | ...                 | ...       | 114                  | ...    | 115     | 127         |
| <i>Nasio-mental complete facial Index</i> , | ...                 | ...       | 92.6                 | ...    | 84.5    | 87.6        |
| Nasio-alveolar length,                      | 69                  | 72        | 68                   | 64     | 68      | 74          |
| <i>Maxillo-facial Index</i> ,               | 52.4                | 51.8      | 55.6                 | 49.6   | 50      | 51          |
| Nasal height,                               | 53                  | 53        | 50                   | 48     | 53      | 58          |
| Nasal width,                                | 26                  | 27        | 24                   | 26     | 26      | 25          |
| <i>Nasal Index</i> ,                        | 49.1                | 50.9      | 48.                  | 54.2   | 49.1    | 43.1        |
| Orbital width,                              | 37                  | 39        | 38                   | 36     | 35      | 41          |
| Orbital height,                             | 37                  | 37        | 33                   | 36     | 32      | 38          |
| <i>Orbital Index</i> ,                      | 100.                | 94.9      | 86.8                 | 100.   | 91.4    | 92.7        |
| Palato-maxillary length,                    | 49                  | 55        | 54                   | 51     | 55      | 51          |
| Palato-maxillary breadth,                   | 66                  | 64        | 68                   | 62     | 67      | 65          |
| <i>Palato-maxillary Index</i> ,             | 134.6               | 116.3     | 125.9                | 121.5  | 120.1   | 127.4       |
| <i>Nasio-malar Index</i> ,                  | 106.1               | 108.9     | 107.5                | 103.   | 108.1   | 106.8       |
| <i>Cranio-facial</i> " " " "                | 76.3                | 80.8      | 75.                  | 83.8   | 78.6    | 89.0        |
| Lower jaw. { Symphysial height,             | ...                 | 34        | ...                  | ...    | 34      | 31          |
| { Coronoid, " " " "                         | ...                 | 66        | ...                  | ...    | 64      | 67          |
| { Condylod, " " " "                         | ...                 | 66        | ...                  | ...    | 63      | 65          |
| { Gonio-symphysial length,                  | ...                 | 85        | ...                  | ...    | 87      | 98          |
| { Inter-gonial width,                       | ...                 | 99        | ...                  | ...    | 101     | 106         |
| { Breadth of ascending ramus,               | ...                 | 33        | ...                  | ...    | 41      | 45          |

The cranial sutures were simple and unossified; a few small Wormian bones were in the lambdoid and the right pterion had an epipterice bone; the jugal processes were tuberculated. The inion was strong and dependent, and the muscular ridges were pronounced. The cephalic index, 78.5, in the higher term of the mesaticephalic group, approached the brachycephali; the vertical index, 81.4, hypsicephalic, was greater than the cephalic. The internal capacity could not be accurately obtained, owing to the cranium being injured.

• BAJAUS OR SEA GYPSIES. TABLE II. PLATES III., V.

The Sea Gypsies, named Bajau, Bajow, Baju, or Badjoo, are wandering fishermen, who live either in boats or in houses raised on piles near the mouths of rivers in Borneo and Celebes. They are said by Sir HUGH LOW to have come originally from Johore on the Straits of Malacca.\* Sir SPENCER ST JOHN described them as short in stature, slight and active, with pinched small faces, low foreheads and bright eyes. They wear the hair tied in a knot on the front of the head. They practise tattooing.

Two adult skulls presented by Dr ADAMSON were labelled Bajau or Bajow. The larger, M, that of Mohammed Tali, was from Brunei, a small native State intervening between North Borneo and Sarawak. The man was said to have been muscular, about 5 ft. 4 in. in stature, with dark skin, coarse long black hair, brown eyes, nose flattened at the bridge, lips moderately thick. He was a well-known cattle thief, and was shot whilst defending a fort which he had built. The smaller skull, N, was marked Malay trader; it may have been that of a man, though the sex characters were not very definite; the wisdoms had not erupted, but the basi-cranial synchondrosis was ossified. The skulls were not smoke-stained, and M retained the lower jaw.

*Norma verticalis*.—The crania were rounded in outline; that of Tali was brachycephalic, cephalic index 82.9, whilst N was hyperbrachycephalic, index 89. The high index was due to the glabella-occipital diameter, in the mean 159 mm., being much less than in the other native skulls from Borneo, whilst the greatest breadth was about the average. The crania were not keeled in the sagittal line; the vault sloped gently downwards to the prominent parietal eminences, below which the side walls were not quite vertical. In M the parieto-occipital slope was almost vertical, though with a slight obliquity to the left, and the back of the skull was flattened, apparently by artificial pressure, so that it was almost in the same vertical plane as the inion. N had a similar parieto-occipital flattening, though without any obliquity. Both were phænozygous.

*Norma lateralis*.—The forehead was almost vertical, the glabella and supraorbital ridges were feeble and distinct from the upper border of the orbit; the nasion was not depressed. The bridge of the nose was faintly keeled with a shallow concavity forward. In M the nasal bones were 17 mm. long in the mesial line, in N only 13 mm. and very

\* They are well known at the present time as frequenting the straits between the islands of the Johore Archipelago, where they bear the name Sea-Jakun or Orang Jaut. They have been regarded as an aboriginal, primitive Malay sea tribe. *Vide* the works of Nelson Annandale, Rudolf Martin, and Messrs Skeat and Blagden.



narrow. In both, the occipital longitudinal arc was the shortest, the parietal the longest. The skulls rested behind on the cerebellar fossæ of the occipital.

*Norma facialis*.—The floor of the nose was separated by a low ridge from the incisive region; the maxillo-nasal spine was moderate, the incisive fossæ were moderate, and in N the canines were deep. In M the anterior nares were relatively narrow, the nasal index, 48, being leptorhine: in N the index, 54·2, was platyrrhine. The nasio-malar index ranged from 103 to 107·5, and the mean was 105·2, platyopic.

The complete facial and maxillo-facial indices were computed in M and seen to be leptoprosopic, and in N the maxillo-facial was almost in the same group; the proportions of length and breadth gave a narrow-faced skull. In M the incisive region projected forwards and produced an alveolar prognathism, although the gnathic index, 96·9, as determined by FLOWER's method, placed it in the orthognathic group; in N the index, 102·2, was mesognathous. In M the orbital index, 86·8, was mesosome, but in N the aperture was rounded and the index, 100, megaseme. In both skulls the hard palate was moderate in depth, and the palato-maxillary index was hyperbrachyuranic. The teeth were betel-stained; the crowns were much flattened in M, but less so in N. The lower jaw in M had strong masculine characters.

The cranial sutures were simple and unossified, without Wormian bones in the lambdoid; the right jugal process in M and both jugals in N had a short pointed paracondylar process. In M the styloid process was ossified to the temporal, and there was a right epipterice bone. In M the basi-bregmatic height was 1 mm. more than the greatest breadth of the cranium, but in N it was 13 mm. less: the mean cephalic index, 85·9, of the two crania exceeded the mean vertical index, 82, hypsicephalic, which is the rule in brachycephalic skulls, and the mean breadth-height index was 95·2. The internal capacity of the cranium of Tali was 1350 c.c., but that of N was only 1180 c.c., a capacity which is more in accordance with that of the female than the male skull.

#### MALAYS. TABLE II. PLATE IV.

The Museum does not contain any Malay skulls from Borneo with which to contrast the skulls above described. Several specimens are indeed marked Malay without any further information, but as their history is obscure I do not dwell on them. Two Malay skulls which have a definite history are worthy of description. One, from a man who had died in hospital in Calcutta, was given to me more than twenty years ago, along with the other bones of the skeleton, by Lieut.-Col. DOUGLAS D. CUNNINGHAM, M.D., F.R.S., and the skeleton, the skull excepted, was described in my memoir in the *Challenger Reports*.\* The other was presented to me, along with the pelvis, in 1889 by the late Dr WM. DUNCAN SCOTT, medical officer in Perak, Malay Peninsula. They were parts of the skeleton of a male Malay, said to be about 26 years old, who

\* Zoology, part xlvii., 1886,—part ii., the Bones of the Skeleton.

had lived near the junction of the Perak and Chenderiang rivers. The lower jaw was present. These skulls are marked P and C in Table II.

• *Norma verticalis*.—The cranial outline in P was broadly ovoid, the cephalic index, 80·9, was brachycephalic; in C the outline was rounded, and the index, 92·6, was hyperbrachycephalic. They had no sagittal ridge, and the slope of the vault to the parietal eminences was moderate, below which the side walls were a little convex. The parieto-occipital slope in P was steep, and the occipital squama projected behind the inion; possibly there was slight occipital flattening; in C the slope of the parieto-occipital region was vertical from the parietal foramina, and the artificial flattening was so marked that the occipital squama did not project behind the inion. The skulls were cryptozygous.

• *Norma lateralis*.—In P the forehead was almost vertical, in C it somewhat receded; in both the frontal eminences were distinct, and the brow was flattened above the upper border and external process of the orbit; the glabella and supraorbital ridges were moderate, and the nasion was slightly depressed; the nasal bridge was feeble, the profile outline was concave; in C the mid-nasal length was 32 mm., in P, with a deeper concavity, 26 mm. The occipital longitudinal arc was the shortest, the frontal and parietal were almost equal. The skulls rested behind on the mastoids.

*Norma facialis*.—The floor of the nose was smoothed down into the incisive region; the maxillo-nasal spine was moderate; the incisive and canine fossæ were moderate: in P the nasal index, 49·1, was mesorhine, in C the nasal height in relation to the width was greater and the index, 43, was leptorhine; the nasio-malar indices showed the profile of the nose to be mesopic. The complete facial index in P was chamæprosopic; in C mesoprosopic, in which the interzygomatic diameter was 145 mm.; in both the maxillo-facial index was leptoprosopic. The gnathic index, as determined by Flower's method in P, was mesognathous, in C orthognathous, though to the eye the upper jaw in C had a forward projection. The orbital aperture was rounded, megaseme; the interorbital diameter was 26 and 24 mm. respectively; in P the supraorbital foramina had complete bony walls. The palatal arch in P was 18 mm. deep opposite the second molar, in C it was shallower; in both the palato-maxillary index was hyperbrachyuranic. In P the teeth had all erupted except the upper wisdoms, the crowns were worn and flattened by use, especially the incisors, the flattened biting edges of which were in contact with each other when the mouth was closed.\* In C the crowns were also much worn, though the edges of the incisors were not so closely adapted as in P; the teeth were deeply stained. The lower jaw was strong, the chin was square and projecting, the angle was well defined.

The cranial sutures were simple and no sutural bones were present. The mastoids and the temporal curved lines were well marked, the inion and occipital curved lines were feeble; in P the styloids were ossified to the temporals, and each vaginal process

\* I may refer to my paper on the relations of the Dentary Arcades in the Crania of Australian Aborigines (*Journ. of Anat. and Phys.*, vol. xxv. p. 461, 1891) for an account of this character in certain races. I may state that I have twice seen the adaptation of the biting edges of the incisors in Scottish students of my anatomical class.



the customary width of the angle in the male than was the angle,  $76^{\circ}$ , of the Challenger specimen. The shape of the brim of the pelvis was not uniform; in the Perak specimen the transverse diameter was much in excess of the conjugate, the form of the inlet was ovoid transversely, and the index was platypellic; whilst in the Challenger example the conjugate exceeded the transverse diameter, the brim was ovoid antero-posteriorly, and the index was dolichopellic. On the other hand, the intertuberal diameter of the pelvic outlet and the depth of the true pelvis were much less in the Perak than in the Challenger examples. The length of the sacrum measured in a straight line and the breadth of the bone at the base were almost alike in the two specimens, and the sacral index was dolichohieric. The first coccygeal vertebra was not apkylosed to the sacrum. The præ-auricular sulcus was a shallow vertical groove; the pectineal line was not raised into a sharp ridge, and the pubic spine was prominent.

The University Museum has recently received two male adult Malay skulls collected by Messrs ANNANDALE and ROBINSON in their expedition to the Malay Peninsula in 1901-02. They have been described in detail by NELSON ANNANDALE, D.Sc., in "*Fasciculi Malayenses*."\* One, No. 21, was from Jambu, Jhèring; the other, No. 22, a Kalantan Malay, was from the town of Patani. In No. 21 the cranium was "square shaped" in outline, the parieto-occipital slope was abrupt and unsymmetrical, the cephalic index 85.9, the skull cryptozygous. In No. 22 the cranium was broadly ovoid, the parieto-occipital slope not quite so abrupt, the cephalic index 79, the skull phænozygous. The vertical index in No. 21 was 85.2, in No. 22, 75.5, and in each, as is so common in brachycephalic skulls, the breadth was greater than the height. In both, the nose was leptorhine, the upper jaw projected forward, the palato-maxillary region dolichuranic, and the complete facial index chamæprosopic. In No. 21 the orbit was microseme and in No. 22 mesoseme.†

The Jambu skull had an incomplete skeleton, the pelvis of which possessed male characters and was a little smaller than the pelvis in my specimen described in the *Challenger Reports*. The conjugate diameter of the brim, 98 mm., was almost equal to the transverse, 100 mm., and the pelvic index, as in the Challenger specimen, was dolichopellic. The length of the sacrum in a direct line was 102 mm., and along the curve 110 mm.; the maximum breadth was 98 mm.; the sacral index, 96.1, was dolichohieric, as in the Challenger and Perak pelvises. The subpubic angle was  $60^{\circ}$ .

\* *Anthropology*, part ii. (a) p. 93, 1904.

† The most recent information on the physical characters of the Malays is to be found in NELSON ANNANDALE'S description in "*Fasciculi Malayenses*," 1904; RUDOLF MARTIN, *Die Inlandstämme der Malayischen Halbinsel*, Jena, 1905; W. W. SKELAT and C. O. BLAGDEN, *Pagan Races of the Malay Peninsula*, London, 1906.

GLOGNER, "Sieben malaische Schädel," *Verhandl. der Berliner Gesells. für Anth.*, p. 378, 1892.

KOHLBRÜGGE, "Anthrop. Beobacht. aus dem Malayische Archipelago," *Verh. der Berliner Gesells. für Anth.*, p. 396, 1900.

## GENERAL OBSERVATIONS ON BORNEO CRANIA.

Owing to the limitation in number of the skulls and the restricted area in the island in which they were collected, the material at my disposal is not adequate to permit a comprehensive survey, based on my own observations, of the craniology of the natives of the whole of Borneo. Sufficient have, however, been examined to enable me to state that in North Borneo, Brunei and Sarawak the crania of the natives are not uniform in character, but show diversities in form and proportion, which justify the conclusion that the island is inhabited by different races. Attempts have been made from time to time, amongst others, by M<sup>M</sup>. DE QUATREFAGES and HAMY, Mr C. HOSE and the naturalists who have studied the people of Sarawak along with him, and by NIEUWENHUIS and KOHLBRÜGGE, from observations on the people of Dutch Borneo, to differentiate the several races, the period when they populated the island, and the order of their immigration.

In an ethnographical survey of the great islands in the Malay Archipelago one cannot overlook the possibility of the presence in them of a Negrito element, characterised by pigmy stature, black skin, and short woolly black hair, either pure or cross-bred with another race or races. The Semangs in the adjacent Malay Peninsula, the Mincopies of the Andaman Islands, and the Aëta Pigmies in some of the Philippine Islands are well-known examples of Negritos occupying countries in more or less close proximity to the great islands of the Archipelago.

In Borneo itself apparently the most primitive people are the Punans, or, to employ the name given by BOCK, as used in south-east Borneo, the Orang Poonans. They are the Forest people who live in the jungles and dense forests in the mountains at the head waters of the big rivers. HOSE and BOCK regard them as the aboriginal inhabitants; they do not cultivate the soil, but live by hunting and on the products of the jungles, and are nomadic in their habits. If a Negrito element existed one would expect it to be met with in these tribes. BOCK described those seen by him in Dutch territory as yellow in colour, the women being much lighter than the men, the hair long and black and the stature moderate, all of which do not conform with Negrito characters. HOSE recognises their fair skin and also large-boned, strong physique. HADDON says that the Punans are broad-headed, with an average cephalic index 81.

The physical characters therefore in important particulars do not accord with those of the Negritos, although, if HADDON's statement be correct, they approximate to them in the relations of the breadth to the length of the head. It should be stated that the Punans are not head hunters and do not build houses. There is also no evidence that the Ukits, also nomadic, who live in the Kayan country in Sarawak, are to be associated with the Negritos; probably they are a branch of the Punans.

The river valleys and the adjoining hill ranges in Borneo are peopled by tribes bearing various names, *e.g.* Sebop, Melanau, Kadayan, Kalabit, Ot Danum, Ulu

Ajar, Land Dyaks, Muruts, Dusuns, Dalits, etc. HOSE, SHELFORD and HADDON have grouped these tribes together by the general name Kalamantans, a term derived from the natives of Sarawak, who give the name Pulo Kalamantan to Borneo. HOSE and SHELFORD group the Punans with the Kalamantans, although the latter are agriculturists and have a higher social organisation than the nomadic Punans. The Kalamantans had probably migrated into Borneo, either from the Asiatic Continent or from the groups of islands to the eastward, at some unknown period.

The observations recorded in the earlier pages of this memoir enable one to speak of the cranial characters of the Muruts, Dusuns, the Dalit Dusun, who form so considerable a proportion of the inland population of North Borneo, and also the Land Dyak from Sarawak. The cephalic index in the ten skulls examined ranged from 69.9 in a Murut to 78 in the Tegahas Dusun, and the mean of the series was 74.8. Five of the skulls had the index below 75, and were distinctly dolichocephalic in form and proportions; in the other five the greater relative breadth placed them in the mesaticephalic group, and of these three were below 77. In four specimens the vertical index exceeded the cephalic, in one these indices were equal, in four the cephalic index was the greater; in the entire series the mean vertical index was 74.6, fractionally lower than the mean cephalic, and not showing so large a difference as is customary in dolichocephalic crania. The nasal index ranged from 46 to 54; three were platyrrhine, two were leptorrhine, five were mesorrhine; the mean of the entire series, 50, was mesorrhine. The gnathic index in nine skulls, as determined by FLOWER's method, ranged from 90 to 101; seven were orthognathous, two were mesognathous, and the mean of the series, 94.8, was orthognathous.

The interzygomatic breadth ranged from 127 to 139 mm. and the mean was 130.6 mm.; the nasio-alveolar length ranged from 62 to 69 mm. and the mean was 65.2; the maxillo-facial index ranged from 47.5 to 52.4; no specimen was chamaeprosopic, four were mesoprosopic, the majority were leptoprosopic, with relatively narrow faces, to which group the mean index of the series, 50, is to be referred. The nasio-malar index ranged from 106.1 to 111.4; no specimen was platyopic or flat-faced, *i.e.* with the index below 106, two were pro-opic, index above 110, the majority were mesopic, which was the mean index, 108.6, of the series, the profile of the nose having a moderate projection. The orbital index ranged from 85 to 100; no skull was microseme, three were mesoseme, seven were megaseme; the mean of the series, 92.5, was also megaseme, with rounded orbits. The palato-maxillary index ranged from 103.5 to 140 mm.; only one specimen had the arch long in relation to the breadth, dolichuranic; the rest had relatively wide arches and were brachy- or hyperbrachyuranic.

From this summary of the characters of the skulls in these Kalamantan tribes it may be stated that they were dolichocephalic or approximated thereto; whilst in some the height was more than the breadth, in others the reverse was seen, but in the crania as a whole the mean height and breadth were almost equal. The nose was moderately wide at the anterior nares and not greatly flattened at the bridge. The face was not

low and of moderate width; the upper jaw was not very projecting; the orbits were rounded, and the palate had, as a rule, a wide and shallow arch.

Since the time of ANDERS RETZIUS anthropologists have recognised the importance of determining the relation of the length to the breadth of the cranium in different races of men and have for many years expressed these relations numerically by the cephalic index. Attention has been subsequently called by J. KOLLMANN to the relation between the length and breadth of the face, and he has employed the term *leptoprosopic* to express a face long and narrow in relation to its breadth, and *chamæprosopic* for a face relatively low and broad. In my memoir on the Craniology of the People of Scotland \* I have suggested an intermediate or *mesoprosopic* group between the two extreme forms.

Little attention, however, seems to have been given to the relation between the length of the cranium and the breadth of the face, and to distinguish if differences in this relation existed in dolichocephalic when contrasted with brachycephalic crania. A numerical expression of the relation between cranial length and facial breadth may be obtained and a *cranio-facial index* computed by the following formula  $\frac{\text{interzygomatic breadth} \times 100}{\text{maximum length}}$ , the length being regarded as = 100.

In the nine crania of the Kalamantan group, in which both the glabello-occipital and the interzygomatic diameters were measured, the cranio-facial index varied from 70.6 in a Murut to 78.5 in the Dalit skull, and the mean was 73.2. It would seem, therefore, that in these people a face relatively high and narrow was associated with a cranium relatively long and narrow. The two skulls with the highest cranio-facial index, 76.3 and 78.5 respectively, had cranial proportions in which the breadth was somewhat greater in relation to the length and the skulls were in the lower term of the mesaticephalic group.

I have not, in the summary of this group, included the two Kweejow skulls, for though both were marked as being of the same tribe, the young skull was definitely dolichocephalic, whilst the adult was in the higher term of the mesaticephalic group. If the proportions shown by the youth's cranium may be regarded as characteristic of the tribe, it doubtless should be associated with the dolichocephalic Kalamantans; but if the mesaticephalic skull more nearly represented the customary proportions, then possibly the tribal character was due to a cross between the Kalamantan and a race the crania of which possessed brachycephalic proportions. The low cranio-facial index, 67.2, of the Kweejow youth is associated with the imperfect development of the face and the dental arcades.

Messrs HOSE, SHELFORD and HADDON have described in Sarawak tribes named Kenyahs and Kayans, and KOHLBRÜGGE and NIEUWENHUIS have also recognised Kayans in Dutch territory. They are believed to have entered Borneo by the rivers which join the sea on the east and south-east coasts, at a period subsequent to the immigration of the Kalamantans, and gradually to have penetrated westward into Sarawak, which

\* *Op. cit.*, p. 606. See footnote to this memoir, p. 783.

they occupied in the region midway between the coast and the highlands of the interior. They are said to have low brachycephalic heads, but no crania of these tribes have come under my observation.

The coast line of Borneo is peopled by Sea Dyaks, Bajaus or Sea Gypsies, and Malays: To all appearance the coast tribes had settled at a period subsequent to the immigration of the Kalamantans, Kenyahs and Kayans. Unfortunately the number of specimens of the people of the coast under examination was too small to enable me to formulate a wide generalisation. Mr HADDON states that the Sea Dyaks have broad heads, with a mean cephalic index 83. The index of my only specimen of the skull was 78.5, approaching the brachycephalic in its proportions, and thereby distinguished from the dolichocephalic Kalamantans, in which group the Land Dyaks have been included.

The two skulls of the Bajaus at once strike the observer as distinct in type from the Kalamantan Muruts and Dusuns. They were on a smaller scale, especially in length, the parieto-occipital slope was so steep as to be almost vertical, and the flattened form of the occiput was obviously in part at least due to pressure applied during infancy. Both skulls were brachycephalic, one indeed was hyperbrachycephalic, the artificial flattening having doubtless contributed in part to the production of an antero-posterior shortening of the cranium.

If the Sea Dyak and the two Bajau skulls be classed as a group, the mean cephalic index was 83.4, brachycephalic, and the mean vertical index was 81.8. The nasal index ranged from 48 to 54.2, and the mean, 51, was mesorhine; the interzygomatic breadth ranged from 123 to 139 mm., and the mean was 130.3 mm.; the nasio-alveolar length ranged from 64 mm. to 72, the mean was 68 mm.; the mean maxillo-facial index, 52.3, was leptoprosopic; the nasio-malar index ranged from 103 to 108.9, and the mean was 106.4, mesopic; the gnathic index ranged from 96.9 to 102.2, and the mean was 99, mesognathous; the orbital index ranged from 86.8 to 100, and the mean was 93.9, megaseme; the palato-maxillary index ranged from 116.3 to 125.9, and the mean was 121.2, hyperbrachyuranic. The coast tribes therefore may be said to be short- or round-headed; the nose moderately wide at the anterior nares and not projecting at the bridge; the face long in relation to the breadth; the upper jaw moderately projecting; the orbits rounded, the palate shallow and with a wide arch.

The two Malay skulls described in this memoir were brachycephalic, with a mean cephalic index 86.7, and with a mean vertical index 85.2; the mean nasal index, 46.1, was leptorhine; the mean interzygomatic breadth was 140.5, the mean nasio-alveolar length was 71, and the maxillo-facial index, 50.5, was leptoprosopic; the mean nasio-malar index, 107.4, was mesopic; the mean gnathic index, 96.9, orthognathous; the mean orbital index, 92, megaseme; the mean palato-maxillary, 123.7, hyperbrachyuranic. In most of these indices the Malays corresponded with the Sea Dyaks and Bajaus.

The cranio-facial index was computed in these brachycephalic skulls. In the Bajau M, marked Tali, it was only 75. In N it was 83.8 and in the Sea Dyak 80.8, materially



higher in these two skulls than in the dolichocephalic Kalamantans, and approximating to the two brachycephalic Malays, in which the mean cranio-facial index was 83·8. The modifications in the cranio-facial index recorded in this memoir point to the association of relatively long heads with narrow faces, and relatively broad heads with wide faces. The cranial characters generally expressed an affinity between the Sea Dyaks, Sea Gypsies and Malays, and pointed in all probability to a common descent. Their immigration from the Malay Peninsula, or from the great islands of the Malay Archipelago, had in all probability been at different periods; and some amount of cross-breeding with the older Kalamantan inhabitants had not unlikely taken place.

Several Museums contain collections of skulls from Borneo which usually do not have tribal names attached to them, whilst in many cases the precise locality from which they came is not definitely specified. In the great collection formed by BARNARD DAVIS, now added to the Museum of the London College of Surgeons, twenty-three skulls said to be from the Island of Borneo\* are entered by the general name "Dyak" without any tribal designation. They are all apparently from Dutch territory, and several are elaborately decorated. DAVIS has recorded the length-breadth (cephalic) index in twenty-one of these skulls. In six the index was 80 and upwards, and of these five were from localities on the coasts; for example, two were from Banjermassin, one from Koesan near Pagottan also on the south, another from the south-east coast, another from the Kapoeas river to the west, a sixth from an unspecified locality. In eight the index was 75 or less; two were from Banjermassin, two from Poeloe Petak, two from the Upper Kapoeas river in Central Borneo, one from Katingan, and one from an unspecified locality. In three with index 76, of which one was from the Tewœa river, a source of the Barito river in Central Borneo, and one with index 77, the locality of which was not stated. One from Sango, Sambas Kapoeas had this index, 78, and two from unspecified localities had the length-breadth index 78 and 79.

In Sir WM. FLOWER's well-known catalogue† of skulls in the Museum of the Royal College of Surgeons, London, four skulls, highly decorated, from Dutch Borneo are marked "Dyak"; two others, also "Dyak," and one unmarked are from Sarawak and are smoke-stained; a skull from a village on the Pantai river, on the east coast of Dutch Borneo, and another from the north-east coast, said to be a Batta,‡ have cephalic indices respectively 81·5 and 72·6. Two additional skulls have since been acquired by the Museum,§ one from North Borneo, index 69·8, the other, a "Ukeit," index 78·5, from the interior. In this collection the cephalic index was more than 80 in three specimens obtained from the east and west coasts; below 75 in five skulls, of which three were

\* *Thesaurus Craniorum*, p. 289 et seq., London, 1867.

† London, 1879.

‡ BARNARD DAVIS catalogues, p. 275, a Batta or Batak skull from the Island of Sumatra, and quotes Junghuhn as locating this tribe in the narrow part of that island.

§ Quoted by H. LING ROTH, vol. 2, p. cexi, London, 1896.

procured at or near the coast; from 78·3 to 78·7 in three specimens, of which two were from the coast.

• MM. DE QUATREFAGES and HAMY, in their classical treatise,\* state that nine crania from Borneo, most of which are from the south of the island, are in the Paris Museums, and of these four were dolichocephalic or subdolichocephalic, with the length-breadth index ranging from 72·4 to 74·8; three were brachycephalic and the corresponding index varied from 80·2 to 84·2. In table xlv. they have summarised the characters of eleven male "Dyak" skulls. The mean index of length and breadth was 77·5, of length and height 75·8, of breadth and height 98·5. SWAVING is quoted as saying,† the mean cephalic index of ten Dyak skulls from the interior of Dutch Borneo is 74·5.

The Museum in Amsterdam, formed by the Professors VROLIK,‡ contains a skull from Sambas, on the west coast of Borneo, which was brachycephalic. Also eight skulls marked "Dyak," two of which were decorated with tin foil; of these one, apparently from Banjarmassin, is said to be brachycephalic, also one from Kahayan to be dolichocephalic. Three marked "born at Banjarmassin" and three without definite locality are also said to be dolichocephalic, but in none of the specimens is the cephalic index stated.

The crania comprised in the London, Amsterdam and Paris Museums, along with those in the University of Edinburgh Anatomical Museum now described, show that the coasts of Borneo are inhabited by people, as a rule, brachycephalic or approximating thereto, a character which indicates that they are either true Malays, or have Malay affinities and descent. On the other hand, the Kalamantan tribes who occupy the interior of the island, details of whose cranial characters are supplied in this memoir, are dolichocephalic in form and proportions. The cross-breeding which doubtless to some extent takes place between the people of these two different types would account for those skulls which possess the intermediate mesocephalic characters.

#### BOTANS OF FORMOSA. TABLE III. PLATES IV., V.

About twenty years ago my friend the late Dr JOHN ANDERSON, F.R.S., presented to me four skulls from the Island of Formosa. They had been collected on a field of skirmish between the Botans and Japanese, by an American naval officer attached to the Japanese military expedition to that island in 1874-5. The heads had been decapitated by the Japanese soldiers, and the skulls were prepared for the American officer, in whose custody they remained until he presented them to Dr STUART ELDREDGE, by whom they were given to Dr ANDERSON. In 1877 Dr ELDREDGE read "Notes on the Crania of the Botans of Formosa" to the Asiatic Society of Japan, which were printed in pamphlet form, a copy of which I received along with the skulls from Dr ANDERSON.

\* *Crania Ethnica*, Paris, 1882.

† Quoted by I. H. F. KOHLBRÜGGE in *L'Anthropologie*, t. ix. p. 2, 1898.

‡ *Catalogue of the Vrolik Museum*, by J. L. DUSSEAU, Amsterdam, 1865.

In this pamphlet Dr ELDRIDGE states that the Botans or Motans are one of the aboriginal tribes of southern Formosa. He describes them as a race of rather fine physical development, of medium height, courageous, frank and impressible like most savages, straight-haired, complexion various, but always of a brown tint, never black. They cultivated the soil, possessed domesticated animals, were fond of the chase, lived under a patriarchal system, and had a rude form of religion, the cult of which was in the hands of priestesses. He noted some of the more prominent characters of the skulls, and gave a number of measurements in inches. Photographs on a small scale of three of the specimens were reproduced in his paper.

As specimens of the skulls of the aborigines of Formosa are seldom met with in Museums, and as Dr ELDRIDGE's Notes seem to have received no attention from anthropologists, I have thought that a more complete description of these skulls, in accordance with modern methods, might prove of interest.

The skulls were those of men in the prime of life. The lower jaw was present in Nos. 1 and 2. No. 1 was in good order; No. 2 had lost part of the frontal, sphenoid and much of the left side of the face; Nos. 3 and 4 were injured and bore the marks of sword-cuts, and the facial bones were absent. In length, breadth and height, and in the horizontal, longitudinal and vertical transverse circumference, the skulls so closely approximated to each other in absolute dimensions and general form that they presented a strong racial or even family resemblance. The skull measurements and indices are given in Table III.

*Norma verticalis*.—The outline of the cranium, though elongated, was in two specimens a broader ovoid and the cephalic index ranged from 74·6 to 77·3. Nos. 3 and 4 were dolichocephalic and Nos. 1 and 2 were respectively 77·1 and 77·3, *i.e.* in the lower term of the mesaticephalic group. The sagittal region was not ridged, the transverse arc was in some rounded from side to side, the parietal eminences were fairly marked, and the skulls were a little wider in the squamous than in the parietal regions. The slope downwards and backwards in the parieto-occipital region was moderate, there was no artificial flattening, and the occipital squama projected only a little behind theinion. Two skulls were phænozygous, one was cryptozygous.

*Norma lateralis*.—The frontal eminences were moderate and the forehead was somewhat receding; the glabella and supraorbital ridges were not specially projecting, though most pronounced in No. 3; in all the specimens they could be differentiated from the outer upper border of the orbits. The nasion was not depressed, the bridge of the nose was not flattened, but moderately projecting. The parietal longitudinal arc was the longest and the occipital arc the shortest in Nos. 1 and 2, but the parietal was the shortest and the occipital much the longest in No. 4. The crania rested behind on the cerebellar occipital fossæ in Nos. 1, 2 and 3.

*Norma facialis*.—The maxillo-nasal spine was moderate in Nos. 1, 2 and 3. The sides of the anterior nares, though sharp in the upper part, were less so lower down, and the incisor border of the nasal floor was smoothed down into the incisive region of the

TABLE III.

*Botans of Formosa and Tibetans.*

|   | Botans. |       |       |       | Tibetans. |              |
|---|---------|-------|-------|-------|-----------|--------------|
|   | 1       | 2     | 3     | 4     | C.        | D.           |
| Collection mark, . . . . .                    | Ad.     | Ad.   | Ad.   | Ad.   | Advd.     | Ad. Metopic. |
| Age, . . . . .                                | M.      | M.    | M.    | M.    | M.        | M.           |
| Sex, . . . . .                                | 1380    | ...   | ...   | ...   | 1570      | 1230         |
| Cubic capacity, . . . . .                     | 179     | 176   | 181   | 178   | 186       | 178          |
| Glabello-occipital length, . . . . .          | 133     | 133   | 139   | 136   | 140       | 100          |
| Basi-bregmatic height, . . . . .              | 74.3    | 75.6  | 76.8  | 76.4  | 75.3      | 56.1         |
| Vertical Index, . . . . .                     | 93      | ...   | 87    | 90    | 98        | 96           |
| Minimum frontal diameter, . . . . .           | 107     | 107   | ...   | 98    | 105       | 108          |
| Stephanic diameter, . . . . .                 | 101     | 98    | 105   | 186   | 103       | 120          |
| Asterionic diameter, . . . . .                | 138s.   | 136s. | 135s. | 133s. | 135       | 141          |
| Greatest parieto-squamous breadth, . . . . .  | 77.1    | 77.3  | 74.6  | 74.7  | 72.6      | 79.2         |
| Cephalic Index, . . . . .                     | 515     | 500   | ...   | 500   | 518       | 518          |
| Horizontal circumference, . . . . .           | 123     | 120   | 125   | 117   | 125       | 132          |
| Frontal longitudinal arc, . . . . .           | 129     | 132   | 240   | 115   | 134       | 130          |
| Parietal " " . . . . .                        | 108     | 110   |       | 131   | 120       | 111          |
| Occipital " " . . . . .                       | 360     | 362   | 365   | 363   | 379       | 373          |
| Total " " . . . . .                           | 298     | 297   | 308   | 295   | 305       | 281          |
| Vertical transverse arc, . . . . .            | 125     | 127   | 122   | 122   | 120       | 124          |
| Basal transverse diameter, . . . . .          | 423     | 424   | 430   | 417   | 425       | 405          |
| Vertical transverse circumference, . . . . .  | 36      | 34    | 33    | 35    | 40        | 31           |
| Length of foramen inagnum, . . . . .          | 102     | 103   | 106   | 102   | 104       | 90           |
| Basi-nasal length, . . . . .                  | 98      | 94    | 98    | ...   | 105       | 104          |
| Basi-alveolar length, . . . . .               | 96.1    | 91.3  | 92.5  | ...   | 101       | 115.6        |
| Gnathic Index, . . . . .                      | 498     | 499   | 504   | 500   | 523       | 494          |
| Total longitudinal circumference, . . . . .   | 132     | 138   | 135   | 130   | 136       | 130          |
| Interzygomatic breadth, . . . . .             | 122     | ...   | 128   | ...   | 127       | 117          |
| Intermalar " " . . . . .                      | 111     | 106   | ...   | ...   | ...       | ...          |
| Nasio-mental length, . . . . .                | 84      | 76.8  | ...   | ...   | ...       | ...          |
| Nasio-mental complete facial Index, . . . . . | 72      | 63    | 67    | ...   | 74        | 65           |
| Nasio-alveolar length, . . . . .              | 54.5    | 45.6  | 49.6  | ...   | 54.3      | 50           |
| Maxillo-facial Index, . . . . .               | 55      | 54    | 53    | ...   | 54        | 52           |
| Nasal height, . . . . .                       | 27      | 25    | 27    | ...   | 28        | 27           |
| Nasal width, . . . . .                        | 49.1    | 46.3  | 50.9  | ...   | 51.8      | 51.9         |
| Nasal Index, . . . . .                        | 39      | 39    | 37    | ...   | 40        | 36           |
| Orbital width, . . . . .                      | 36      | 34    | 35    | ...   | 36        | 36           |
| Orbital height, . . . . .                     | 92.3    | 87.2  | 94.6  | ...   | 90        | 100          |
| Orbital Index, . . . . .                      | 53      | 50    | 53    | ...   | 60        | 53           |
| Palato-maxillary length, . . . . .            | 61      | 63    | 71    | ...   | 67        | 56           |
| Palato-maxillary breadth, . . . . .           | 115     | 126   | 134   | ...   | 111       | 105.6        |
| Palato-maxillary Index, . . . . .             | 108.4   | ...   | 108.3 | ...   | 107.7     | 102.1        |
| Nasio-malar Index, . . . . .                  | 73.7    | 78.4  | 74.5  | 73    | 73.1      | 73           |
| Cranio-facial Index, . . . . .                | 32      | 23    | ...   | ...   | ...       | ...          |
| Lower jaw. { Symphysial height, . . . . .     | 69      | 58    | ...   | ...   | ...       | ...          |
| { Coronoid " " . . . . .                      | 75      | 62    | ...   | ...   | ...       | ...          |
| { Condylod " " . . . . .                      | 98      | 91    | ...   | ...   | ...       | ...          |
| { Gonio-symphysial length, . . . . .          | 100     | ...   | ...   | ...   | ...       | ...          |
| { Inter-gonial width, . . . . .               | 42      | 40    | ...   | ...   | ...       | ...          |
| { Breadth of ascending ramus, . . . . .       |         |       |       |       |           |              |

maxilla. The mean nasal index was mesorhine, 48.7; in Nos. 1 and 2 the anterior nares were wider absolutely and relatively to the height of the nose, but in No. 2 they were narrower and the index was leptorhine, 46.3. In Nos. 1 and 2 the complete face

was short absolutely and relatively to the interzygomatic breadth, and the complete facial index was chamaeprosopic. The disproportion between the interzygomatic breadth and the nasio-alveolar length was, however, not so great, and the maxillo-facial index was in No. 1 leptoprosopic and in Nos. 2 and 3 mesoprosopic. The canine and incisive fossæ were moderate in depth. The interorbital breadth ranged from 19 to 24 mm. The relation of the bi-malar to the nasio-malar diameter gave a nasio-malar index 108·3, so that the nasal profile was mesopic, i.e. between a platyopic and pro-opic face. The orbital apertures were rounded and the mean orbital index was megaseme, 91·3. The palatal arch was shallow in one specimen, and wide in all in relation to the length; the palato-maxillary index was brachyuranic, and in two even hyperbrachyuranic. The upper jaw was orthognathous and the mean gnathic index was 93·3.

The cranial sutures were distinct in Nos. 1, 2 and 4, but in No. 3 they were almost obliterated. No. 1 had a small Wormian bone in the occipito-mastoid suture. The alisphenoid articulated with the parietal, but in No. 3 the junction was reduced to a pointed bar of bone. Infraorbital sutures were present in Nos. 1 and 2. The jugal processes were somewhat tuberculated, but no skull had a 3rd condyl. The inion, occipital curved lines and mastoids had male characters. The lower jaw was more massive in No. 1 than in No. 2; its vertical diameters were longer and the chin was thicker and more projecting, but in both the angle was almost rectangular and the ascending ramus was broad. The teeth were stained with betel, and the molars were flattened through use on the grinding surface of the crown.

The Botan crania in their proportions were associated with the dolichocephalic type of skull, for whilst two had the cephalic index below 75, the other two were in the lower term of the mesaticephalic group. The mean cephalic index was 75·9, the mean vertical index, 75·7, was hypsicephalic. In the mesaticephalic crania the vertical index was less than the cephalic, but in the dolichocephalic the vertical index was greater than the cephalic, in accordance with the rule that in the dolichocephali the height is more than the breadth. The cranio-facial index ranged from 73 to 78·4, and the mean was 74·9, a figure which associated these relations to the dolichocephalic type in Borneo.

The northern end of Formosa and the fertile plain along the western half of the island have long been frequented for purposes of trade, and they have been occupied successively by the Dutch, Chinese and Japanese, but the mountainous districts in the interior, the south end and the east coast have been little visited, for they have been almost inaccessible through their mountainous configuration and the savage character of the people. Since Formosa was ceded by the Chinese to Japan in 1895, attempts have been made by the Japanese administrators to open up the country, to determine the names of the aboriginal tribes and to locate their position. Much useful information has been collected and embodied by Consul J. N. DAVIDSON in an important volume, well illustrated and provided with a map, compiled from the latest Japanese Government surveys.\* He arranges the aborigines in eight groups, and the hilly plains of the south

\* *The Island of Formosa Past and Present*, London and New York, 1903.

end of the island are occupied by the Paiwan group, of which the Botans or Bootangs are apparently members.\* The Paiwans practise tattooing, they wear a disc of wood in the lobule of the ear, and are head hunters, the heads being stored in enclosures of stone near the houses. Consul R. SWINHOE, who travelled in the southern part of the island, named the aborigines who inhabit the mountains Kalecs.† He describes the people as brown or yellowish brown, the eyelids drawn down at the inner angle, eyes far apart, nose of moderate size, neither broad nor flattened, heads shaved, hair plaited into short queues. He considered them to resemble the Tagal people of Luçon in the Philippines. Dr SCHETELIG described four skulls from Formosa.‡ Two of these from the north-east coast were from a tribe which he states is named Shekwan by the Chinese, a term which is synonymous with Sek-hoan, the cooked barbarians of the plain, as the semi-civilised tribes are sometimes called § in contra-distinction to the Chhi-hoans, raw barbarians of the mountains, or unsubdued savages. SCHETELIG stated that these people had a yellow complexion, dark heavy hair, dark eyes, well-shaped oval eyelids, broad nostrils, broad faces, broad prominent cheek-bones. The skulls were oval in outline, not flattened on the roof, the mean cephalic index was 72, the mean vertical index 76.1, *i.e.* more than the cephalic; the skulls were therefore dolichocephalic, and, as is the rule in this group, the height exceeded the breadth. These skulls differed therefore materially in the proportions of the cranium from brachycephalic Malays and brachy- or mesati-cephalic Chinese. SCHETELIG also gives a brief account of two skulls obtained, it was said, from a hill tribe in the south of Formosa, which had been so much injured that only partial measurements could be taken; the mean cephalic index was 81.5, and the vertical index, in the only one in which it could be accurately computed, was 76.7. He was of opinion that these skulls showed Malayan affinities, more especially to the wild tribes of Luçon. He considered them to resemble a Malayo-Philippine type.

In regard to the question of the presence of a Negrito element amongst the aborigines of Formosa, SWINHOE hinted at the possibility of the wildest of the mountain tribes being of dwarf stature and allied to the Negritos, though he guarded himself by saying that he had not seen them. A. B. MEYER has discussed with much detail and acumen || the distribution of the Negritos in the Philippine Islands and beyond them. He does not concur in the opinion that Negritos formed a part of the aboriginal inhabitants of Formosa, and he has also been led to the conclusion that their presence in Borneo had not yet been proved. Dr G. L. MACKAY, who spent many years as a missionary in Formosa, and lived for weeks at a time in the villages, made careful inquiries among the mountain tribes in the far south, in the centre and in the north of the island, and was

\* In Consul DAVIDSON's map the most southerly members of this group are named Kooluts.

† *Report of British Association*, p. 129, Birmingham meeting, 1866. *Proc. Roy. Geogr. Soc.*, vol. x. p. 122, 1866.

‡ *Trans. Ethnol. Soc. London*, vol. vii. p. 215, 1869. I have computed the indices from the measurements recorded by SCHETELIG in his table i.

§ *From Far Formosa*, by G. L. MACKAY, D.D., p. 93, Edinburgh and London, 1896. *Pioneering in Formosa*, by W. A. PICKERING, C.M.G., p. 65, London, 1898.

|| *The Distribution of the Negritos*, Dresden, 1899.

definitely told that there were no woolly-haired races within the mountains, or anywhere else in the island.\* From tradition and physical characters, he is of opinion that the aborigines are of Malayan origin, and are descendants of emigrants from the Malay Peninsula and the islands of the China Sea. He states that in the practice of tattooing, in head hunting, in their dress, ornaments and houses, and in their ancestral worship they are akin to the hill tribes of Borneo. As with the Kalamantan tribes in Borneo, their heads are dolichocephalic or approximating thereto, and not brachycephalic, a character to which due consideration requires to be given when their possible Malayan origin is under discussion.

### INDONESIANS.

The islands off the south and south-east of Asia and the adjacent parts of that continent are peopled by four types of men—Mongolian Chinese, Malays, Negritos, and Indonesians. The Mongols, Malays and Negritos are brachycephalic or approximating thereto in cranial form and proportion. The term Indonesian, suggested by J. R. LOGAN, was employed by M. HAMY in 1877† to express aboriginal people properly belonging to the great islands of the Indian Archipelago, and it has even been extended so as to include the brown-skinned Polynesians of the easternmost islands of the Pacific. As the Polynesians and some of the tribes in the Indian Archipelago have crania of the brachycephalic type, the term Indonesian would therefore be held to embrace races whose skulls are brachycephalic in proportions. Other anthropologists, again, and in this I am disposed to concur, employ the term to designate tribes in whom the head and skull are dolichocephalic in form and proportion, or approximating thereto,‡ with a mesorhine nose, brown skin, varying in the depth of tint, long, straight, black hair, short stature, 5 ft. 2 in. to 5 ft. 4 in. The Kalamantans of Borneo are typical Indonesians. The Battaks of Sumatra are also regarded as Indonesians: MM. DE QUATREFAGES and HAMY refer to the skull of a Battak in a museum in Göttingen with the cephalic index 70·1; to two others in the Batavian Museum with almost the same proportions; the specimen in the BARNARD DAVIS collection had the index 77. KOHLBRÜGGE states that the Tenggerese, a mountain race in Java,§ are Indonesians. His measurements were not on skulls, but on living people, and he gave the mean cephalic index of 130 individuals, 79·7, mesaticephalic, which in the skull would have yielded an index about 77. In Timor, Celebes|| and other islands of the Archipelago Indonesian

\* *From Far Formosa (op. cit.).*

† E. T. HAMY, "Les Alfours de Gilolo d'après de nouveaux renseignements," in *Bull. Soc. de géogr. de Paris*, 6th série, t. xiii. p. 491, 1877; also "Les races Malaises et Américaines," in *L'Anthropologie*, t. vii., 1896. J. DENIKER, *The Races of Men*, London, 1900.

‡ In previous Memoirs (*Trans. Roy. Soc. Edin.*, vol. xxxix. p. 744, 1899, and vol. xl. p. 596, 1903) I have noted the importance of dividing the mesaticephalic into two groups, those with index below 77·5 approximate to the dolichocephalic, whilst those with index above 77·5 approximate to the brachycephalic type.

§ *L'Anthropologie*, t. ix. p. 1, 1898.

|| Since this memoir was in type I have, through the courtesy of Drs PAUL and FRITZ SARASIN, received a copy of the Memoir of Dr FRITZ SARASIN, *Versuch einer Anthropologie der Insel Celebes*, Wiesbaden, 1906. An elaborate account

tribes have been studied whose heads are either dolichocephalic or approximating thereto. Professor CLELAND found\* the proportion of the length to the breadth of the cranium in a Sulu Islander to be 75.

In a recent important treatise on the people of the Philippine Islands, based on the study of 270 skulls in the Museum at Leiden, G. A. KOEZE has figured and described the cranial characters of various tribes in these islands.† He recognises Negritos, whom he regards as the original inhabitants, Malays from two successive invasions separated by an interval of many years, Chinese, Japanese, and to a lesser extent Europeans. Moreover, he thinks that the dolichocephalic Tagbanua tribe is the remains of a Melanesian stock which had formerly lived in the Philippines. Cross-breeding between these races had taken place, varying in its proportion in the different tribes. He regards the Ilocanos as having the purest Malay blood; the Visayans and Tagals possess a large proportion, but also have Indonesian characters. The Igorrots, he states, are especially Indonesian; he concludes, however, that they are a cross between the Negritos and the Malays of the first invasion, though those who live in the north of Luzon show traces of Mongolian intermixture. The Igorrots in the cranial length and breadth are, from VIRCHOW'S observations, mesocephalic with a great tendency to be dolichocephalic. KOEZE, again, of twelve crania found seven mesocephalic and five definitely brachycephalic, with a mean index 80.5; he sums up, therefore, that the type is mesocephalic with a great tendency to be brachycephalic. He looks upon the Igorrots as corresponding with the "Dyaks," and they are also head hunters. If the Igorrots are to be regarded as a cross between the Negrito and Malay, and at the same time Indonesians, and if a similar origin is to be associated with the Indonesian tribes of Borneo, it is difficult to comprehend how a cross between two brachycephalic races like the Negrito and Malay could produce dolichocephalic tribes such as the Kalamantan Muruts, and Dusuns. It seems, therefore, that the dolichocephalic Indonesians in their origin and descent should not be regarded as the product of cross-breeding, but that they rather are a race independent and definite in their characters. When the cephalic index is brachycephalic or approximates thereto in a so-called Indonesian tribe a cross-breeding with Malay, Negrito or Mongol may be inferred.

We may now pass, by way of the Philippine Islands, northward to the Island of Formosa. Here, as has already been stated, we find, amongst the mountains, tribes with skulls either dolichocephalic or closely approximating thereto, with brown skins, straight black hair, and from their practice of head hunting and other customs resembling the hill tribes of Borneo. It seems appropriate to associate them with the Indonesian race, which constitutes therefore a distinct factor in the population of the

is given of the external physical characters and of the measurements of the head and body of living natives. Owing to the almost impossibility of obtaining human skulls and skeletons in the course of their travels in Celebes, the authors were not able to give an account of the osteology of the people on lines similar to those pursued in their great work on the Weddars and other people in Ceylon.

\* *Journal of Anat. and Phys.*, vol. xi. p. 663, 1877.

† *Crania Ethnica Philippinica*, Haarlem, 1901-1904.



great islands from Sumatra to Formosa, although modified in some localities by intermixture with Negrito, Malay, Chinese, and even Arab blood.

Turning now to the southern part of the Asiatic Continent we find in the Malay Peninsula three definite types of men.\* The Semangs, a typical Negrito race, brachycephalic, with black skins, short woolly hair, broad flat noses, eyes open, not oblique, low stature, 1491 mm.; the Malays, some civilised, others savage, brachycephalic, with dark yellow or copper-coloured skins, long straight smooth hair, flattish nose, wide nostrils, high cheek-bones, eyes moderate in size, rarely oblique, stature a little higher than in the Semangs; the Sakais, or Senoi as Professor RUDOLF MARTIN prefers to name them,† are dolichocephalic, skin from dark brown to yellowish brown, hair long, black, wavy, nose not so broad and flat, high cheek-bones, eyes small, horizontal, stature slightly more than in the Semangs. In their physical characters the Sakais correspond in head form with the Indonesians, whilst the colour of the skin and the character of the hair are not unlike in the two, but in stature they are a pigmy race.

Two Selung skulls brought from the Mergui Islands on the west coast of the Malay Peninsula by Dr JOHN ANDERSON, which I measured at his request,‡ had the cephalic index 76·3 and 76·6 respectively; in the male the cranial height was more than the breadth, but in the female a little less, probably a sexual difference; in one the nose was mesorhine, in the other platyrrhine. Although the index was mesaticephalic, it was in the lower term of that group, and pointed to the affinity of the people with a long-headed race. The skin was reddish brown, darker and not with the olive tint of the Malays, the hair long, coarse, black, with sometimes a tendency to curl, eyes black and slightly oblique. The Selungs show in some respects Indonesian characters, with possibly a Malay intermixture. A proportion of the people of the Nicobar Islands would seem to be dolichocephalic. The savage tribes, named by DENIKER§ the Mois, who occupy in Cambodia the country between the Mekong river and the coast of Annam, are dolichocephalic, about 5 ft. 2 in. in stature, skin yellowish brown, hair more or less wavy, eyes straight, and they have apparently Indonesian characters.

The hill districts to the north of Burma are occupied by tribes known as Lushais, Chins, and Nagas,|| the crania of which are, as a rule, dolichocephalic or approximating thereto, and I have described crania from Upper Burma itself possessing definite dolichocephalic form and proportions. From Colonel WADDELL's measurements of the heads of the people in the Brahmaputra valley¶ it is obvious that in some of these

\* See the writings of NELSON ANNANDALE, RUDOLF MARTIN, and Messrs SKEAT and BLAGDEN already referred to in note on p. 797. Also my memoirs on Indian Craniology, Part ii., chapter on the Sakai, in *Trans. Roy. Soc. Edin.*, 1901; W. L. H. DUCKWORTH, *Studies from the Anthropological Laboratory*, Cambridge, 1904.

† The term Sakai is used by many travellers as a generic term to include all the pigmy wild tribes in the Malay Peninsula. In the subdivision of these into groups, whilst one is named Semang, it is advisable, as MARTIN suggests, that another term than Sakai should be applied to another of the subdivisions, hence his name Senoi.

‡ My description of the skulls, now in the Anatomical Museum of the University of Edinburgh, is included in Dr ANDERSON's memoir on the Selungs of the Mergui Archipelago, London, 1890.

§ *The Races of Men*, London, 1900.

|| I have described their crania in Part i. of my contributions to Indian Craniology, *Trans. Roy. Soc. Edin.*, 1899.

¶ *Journ. Asiatic Soc. Bengal*, vol. lxix. pt. iii., Calcutta, 1901.

tribes the skulls would be dolichocephalic, and I have elsewhere described the skull of a Kham warrior from Eastern Tibet which was distinctly dolichocephalic.

. In the Island of Ceylon the Veddahs are a pronounced dolichocephalic people. In the form of the cranium, and in their long, black, wavy hair, the Veddahs have affinities with the Sakais (Senoi) of the Malay Peninsula. In India itself the Tamils and Pariahs of southern India, the Gonds, Oraons, Paharias, Mundas, Kols and Bhumijs of the Central Provinces constitute, under the collective name of the Dravidians, a definite portion of the population, and possess marked dolichocephalic skulls.\*

It is obvious, therefore, that both in the groups of islands and in the southern part of the adjacent continent, in addition to such well-marked brachycephalic types as the Negritos, Malays and Mongolians, people with skulls dolichocephalic in form and proportions are widely diffused. The dolichocephalic people, though corresponding in the character of the cephalic index, vary amongst themselves in some other respects. The nose, though not leptorhine, is often platyrrhine as in the Dravidians, but mesorrhine in other tribes; the face is sometimes low, chamaeprosopic, at others relatively longer and narrower, leptoprosopic; the orbits in some are low, microseme, in others more rounded, megaseme; the upper jaw is either ortho- or mesognathous, seldom prognathous. The palato-maxillary arch is usually brachyuranic. The skin varies in colour from dark brown, or almost black, in the Dravidians to a lighter or even yellowish brown in the islanders; the hair is black, long, straight, though occasionally wavy; the stature is generally from 5 ft. to 5 ft. 4 or 5 in., but in the Sakais (Senoi) it is below 5 feet or pigmy. Subject to these modifications, a general physical type prevails in these scattered dolichocephalic people, one which in many respects corresponds with that so often referred to as Indonesian. It is not unlikely that they may in the main have a common descent, though, owing to their wide diffusion in southern Asia and the adjacent islands, which has brought them into close contact with such potent races as the Mongols, Malays, Negritos, Melanesians, and even Polynesians, they have become modified, and the character of the modification has been influenced by that of the race with which an intermixture of blood has been effected.

Even if we were to give as wide an interpretation to the term Indonesian as is above indicated, there would be no difficulty in differentiating them from the dolichocephalic, black skinned, black frizzly haired, platyrrhine, prognathic Melanesians, or from the dolichocephalic, black skinned, black straight haired, platyrrhine, prognathic aborigines of the Australian Continent.

In writing this chapter on the Indonesians I have confined myself to the consideration of the physical characters which bear on the affinities of the several tribes, and I have made no reference to the important subject of linguistic relations, a department of anthropology outside the range of my studies. I would only remark that although the Malay tongue and its dialects are spoken throughout the Archipelago and as far north as Formosa, both by Malays and Indonesians, this, in itself, does not

\* See for measurements and other details my memoirs on Indian Craniology already referred to.

prove that community of language implies common descent and race. Examples are not unknown elsewhere of a race having lost its original tongue and speaking a language acquired from another race with which it has been brought into intimate contact, through conquest, immigration, or otherwise.

### TIBETANS. TABLE III. PLATE V.

In Part iii. of my series of Memoirs on the Craniology of the People of the Empire of India I described and figured the skulls of two natives of Tibet, which had been presented in 1905 by Major C. N. C. WIMBERLEY, I.M.S. One of these, from Lhasa, was an example of the brachycephalic type; the other, a warrior from the Kham province in Eastern Tibet, on the other hand, was dolichocephalic in form and proportions. The skulls were representative of the two distinct types of head which exist in the people of Tibet. These skulls are marked A and B in the list of Tibetan crania in the University Museum. In connection with these specimens, I discussed the physical characters and affinities of the Tibetans.

I have the pleasure of acknowledging the receipt, in October 1906, of two skulls and a skull bowl or cap collected at Gyantse, Tibet. They were presented by Lieutenant F. M. BAILEY, the British Agent at the town of Gyantse, and they had been prepared for him by Captain R. T. STEEN, I.M.S., the Agency Surgeon. The skull bowl was said to be a part of a Khamba skull, but no special information is given regarding the other specimens.

I have carefully examined the two skulls, which I shall designate C and D. They were both males and had reached adult life, though, from the condition of the sutures and teeth, C was obviously much older than D. The lower jaws were absent.

Skull C. *Norma verticalis*.—The cranial outline was an elongated ovoid, dolichocephalic, cephalic index 72.6; there was no sagittal ridge, and though the slope from the sagittal suture to the parietal eminences was well marked, the vertex could scarcely be called roof-shaped; the side walls were almost vertical, the parieto-occipital slope was moderate, and the occipital squama projected behind the inion. The skull was phænozygous.

*Norma lateralis*.—The forehead slightly receded; the glabella and supraorbital ridges were moderate, and the latter were not fused with the outer upper border of the orbit, above which, as in the Kham skull, the frontal was flattened as far as the temporal ridge.\* The nasion was not depressed. The bridge of the nose had a low mesial keel and the profile outline showed a shallow concavity. The nasal bones at the mid suture were 24 mm. long. The parietal longitudinal arc was the longest, the occipital arc the shortest. The cranium rested behind on the cerebellar fossæ.

\* Professor CUNNINGHAM, in the study of the evolution of the region of the eyebrow, has pointed out the morphological importance of distinguishing the supra-orbital ridge and the upper border of the orbit, in their bearing on the significance of the great ridges which are found in such a skull as that from the Neanderthal.

*Norma facialis*.—The floor of the nose was smoothed down into the incisive region; the maxillo-nasal spine was low, the incisive and canine fossæ were deep. The anterior nares were wide, but, owing to the nasal height, the nasal index was not platyrrhine but mesorrhine, 51·8. The nasio-malar index was 107·7 and the facial profile was mesopic. The face was wide, 136 mm., but, as the superior maxillæ were relatively long, 74 mm., the maxillo-facial index, 54·3, was leptoprosopic.\* The upper jaw was mesognathic with an index 101. The interorbital width was 26 mm. The orbital aperture was rounded and the index, 90, was megaseme. The palate was deeply arched, being 17 mm. in depth opposite the 2nd molar; the palato-maxillary index, 111, was mesuranic. The teeth were much worn, but were not stained. The cranio-facial index, 73·1, was low, in harmony with the dolichocephalic type.

The sutures of the cranial vault, the squamous excepted, were almost obliterated; a small epipteric was in the right pterion. The temporal curved lines were well marked, but the occipital curved lines, inion and mastoids were moderate. The jugal processes were tuberculated. The cephalic index, 72·6, was dolichocephalic, the vertical index, 75·3, was hypsiccephalic, and the basi-bregmatic height exceeded the greatest breadth.

Skull D.—This skull showed structural peculiarities which had accentuated individual characters and had doubtless modified the racial features. Most remarkable was the great development of Wormian bones in the lambdoid and squamous sutures. In the lambdoid these bones were usually four-sided and the transverse diameter was the shorter; they had long denticulations intercalated between corresponding processes of the parietal and occipital bones, and as the ossicles were directed obliquely they caused the occipital squama to project backwards behind the parietal, so as to form a shelf-like projection at the back of the skull and to modify the length of the cranium.\* The sutural bones in the squamous regions were much smaller, and were arranged so as to push the squamous temporals laterally, beyond the plane of the parietals, and to add to the breadth of the cranium in these regions. The alisphenoid had a narrow articulation with the parietal. A small Wormian was in the anterior sagittal suture and the frontal was metopic. Another character was a fissure which cut across the basis-cranii, 7 mm. in front of the foramen magnum, and was continued laterally into the jugular foramina. The basion sloped upwards so as to affect the measurements made from it, the plane of the foramen magnum was directed upwards and forwards, and the occipital condyls were flattened, but there was no 3rd condyl. It was difficult to say definitely if the basi-cranial fissure was a congenital defect in ossification, or was due to fracture produced during life, though the former is probably the correct explanation.

*Norma verticalis*.—The cranial outline was broadly ovoid and not quite symmetrical, owing to the arrangement of the Wormian bones. The vault was not ridged and the parietal eminences were feeble. The cranium was cryptozygous.

\* This peculiar feature has been from time to time noticed by previous writers. LUCÆ has figured two specimens in *Zur Architectur des Menschenschädels*, plates ii., xii., Frankfurt, 1857. In the Edinburgh University Museum are two skulls dating from the time of the Mourees, one of which I have figured in fig. 26. They show the character in an extreme form, and several added by myself exhibit it in a minor degree.

*Norma lateralis*.—The forehead was almost vertical, the glabella and supraorbital ridges were feeble, the nasion was not depressed, the nasal bones in the mesial line were 23 mm. long; the bridge was not keeled, the nose was flattened at its root and projected so slightly in front of the outer borders of the orbits that the nasio-malar index was only 102, and the nasal profile was markedly platyopic. The interorbital width was 23 mm. The frontal longitudinal arc was the longest, the occipital was the shortest. The cranium rested behind on the cerebellar fossæ, which were unusually bulging.

*Norma facialis*.—The maxillo-nasal spine was moderate and the floor of the nose was smoothed off into the incisive region. The canine fossæ were deep. The anterior nares were wide and the nasal index was in the upper mesorhine group, 51·9. The upper jaw was somewhat prognathic, but the displacement of the basion interfered with the normal measurements from that region, and the gnathic index, computed by FLOWER'S method, was 115·6. The face was wide, the cheek bones were prominent, and, as the vertical diameter of the maxillæ was small, the maxillo-facial index was chamaeprosopic. The interorbital width was 23 mm. and the orbital apertures were round and megaseme, index 100. The palate was shallow and elongated, the index, 105·6, was almost dolichuranic. The teeth were lost except a right molar, the crown of which was worn. The cranio-facial index was 73.

The cephalic index, 79·2, placed the skull in the higher term of the mesaticephalic group, and the vertical index, 56·1, was remarkably low, but, owing to the osteological peculiarities of the cranium already described, the measurements of length, breadth and height were affected, and their respective indices cannot be relied on as giving definite racial characters; though, as the sutural bones had influenced both the length and breadth of the cranium, it is possible that the lambdoidal and squamosal ossicles may partially counterbalance each other in their effect on these two dimensions (Pl. V. fig. 25).

There can be no doubt that the skull C is dolichocephalic in form and proportions. In length, breadth, height, horizontal and vertical transverse circumference, nasio-malar, cranio-facial and maxillo-facial indices, it is closely allied to the measurements of the Kham warrior described in my previous memoir. It differs from it in the orbital and palato-maxillary indices being somewhat less, and in the nasal and gnathic indices being larger, so that the relative width of the anterior nares and the projection of the upper jaw are greater. The two skulls corresponded, however, with each other in so many important characters that there seems little doubt that the skull C from Gyantse was of the same race as the one from the Kham province.

Owing to the variations in the cranial bones, already described, in D, it is probable that the race type in it is modified and concealed by the special characters of the skull. It would, however, seem as if it approximated to the brachycephalic type, and was, perhaps, a cross between the broad-headed Mongolian and the long-headed race which obviously constitutes an important element in the population of Tibet.

The bowl or cap which accompanied the two skulls had evidently been carefully

removed from the base of its skull, for the sawn edge was horizontal and had been polished. I compared it with some specimens of Tibetan praying drums in the Anatomical Museum of the University, formed by the apposition of the vaults of two skull bowls, and I have little doubt that the cut section had been covered with a layer of dried skin, and had formed one of the two segments of a praying drum. The Tibetans evidently regard the bowl of the skull as an object to be utilised in religious ceremonial and as having a symbolical or mystic signification. Colonel WADDELL, in his admirable work on Tibet,\* gives a figure "Revelation Gospels" in which a skull bowl is held in the left hand and a trumpet formed of a human thigh bone in the right, and another figure of a hermit of the order of St. Mila who holds a skull bowl also in the left hand. The conversion of the femur into a trumpet is another example of the utilisation of a part of the human skeleton in the ceremonial observances of the people of Tibet, and the Museum possesses several specimens of this kind.

In this skull bowl the section had been made a little above the glabella through the supra-nuchal part of the occiput, and below the highest part of the squamous suture. The length was 176 mm. and the greatest breadth 134 mm., which gave an index 76.1. If the glabella had been present, the index would have been a little less, so that the skull had probably been dolichocephalic. In the bowls of the two praying drums in the Museum the section had been made somewhat higher in the skull, and the relations of length and breadth could not so well be determined.

#### SAGITTAL SECTIONS.

In this memoir, as in its predecessors, I have reproduced tracings of sagittal sections of some of the skulls which have been described, in order to show the contour of the skull immediately on one side of the mesial plane. Lines, radiating from the basion to definite points on the surface of the skull, as well as other lines which pass between other anatomical points, have been drawn. As I have explained the direction of the lines and the position of their terminal points in my *Challenger Report*, and in Part iii. of "The Craniology of the People of the Empire of India," I may refer to these memoirs for a detailed description of the significance of the lines. The measurements and the points between which the lines were drawn are given in Table IV.

In comparing the measurements of the three skulls with each other, it should be kept in view that they differ in the proportions of length and breadth. The Murut is dolichocephalic, the Botan from Formosa is mesaticephalic, the Bajau is brachycephalic. Whilst those radial measurements which express the height of the cranium as the basi-lambdal, -perpendicular and -bregmatic, show comparatively little difference in the three crania, the radii which run more in the direction of cranial length, as the basi-inial, -glabellar, -nasial, are much shorter in the Bajau than in the other crania.

\* *Lhasa and its Mysteries*, London, 1905.

TABLE IV.

*Sagittal Sections.*

|  | Murut A.<br>C.In. 73·9. | Bajau M.<br>C.In. 82·9. | Botan 1,<br>Formosa.<br>C.In. 77·1. |
|--|-------------------------|-------------------------|-------------------------------------|
| Basi-inial radius.                                     | 83 mm.                  | 75 mm.                  | 81 mm.                              |
| „ occipital  | 96                      | 98                      | 106                                 |
| „ lambdal  | 112                     | 113                     | 110                                 |
| „ perpendicular  | 136                     | 139                     | 134                                 |
| „ bregmatic  | 135                     | 137                     | 133                                 |
| „ glabellar  | 107                     | 100                     | 111                                 |
| „ nasial   | 101                     | 96                      | 102                                 |
| „ alveolar   | 94                      | 93                      | 98                                  |
| Nasio-tentorial plane,                                 | 176                     | 158                     | 175                                 |
| Tentorio-bregmatic line,                               | 88                      | 89                      | 86                                  |
| „ perpendicular  | 90                      | 93                      | 88                                  |
| „ lambdal  | 56                      | 58                      | 49                                  |
| „ occipital  | 7                       | 28                      | 36                                  |
| Nasio-bregmatic chord,                                 | 108                     | 107                     | 110                                 |
| Perpendicular therefrom to outer table of frontal,     | 27                      | 26                      | 26                                  |
| The same to inner table,                               | 20                      | 20                      | 20                                  |
| Fronto-occipital diameter of cerebral cavity,          | 163                     | 151                     | 161                                 |
| From perpendicular radius to frontal pole of cavity,   | 90                      | 82                      | 78                                  |
| From perpendicular radius to occipital pole of cavity, | 73                      | 72                      | 83                                  |

This difference in the antero-posterior diameter of the brachycephalic Bajau is also very marked in the length of the nasio-tentorial plane and of the fronto-occipital diameter of the cerebral cavity above that plane. The cavity in front of the perpendicular radius expresses generally the position and extent backwards of the frontal lobe of the cerebrum, its antero-posterior diameter is longest in the dolichocephalic Murut and shortest in the Botan; whilst the part of the cavity behind that radius, in which the parietal and occipital lobes are lodged, is shortest in the Bajau, and much the longest in the Botan. The series of measurements above the nasio-tentorial plane, more or less vertical in direction, which express the height of the cerebral cavity, though not differing much from each other in the bregmatic and perpendicular regions, show a marked difference in the tentorio-lambdal and -occipital regions, for whilst in the former the Bajau is the longest and the Botan much the shortest, in the tentorio-occipital the Botan is the longest and the Murut is remarkably small. The arc of the frontal bone and the space in the cerebral cavity bounded by the nasio-bregmatic chord, to which attention has been especially called by Professor CUNNINGHAM, is almost equal in the three crania. The length of the cerebral cavity between the frontal and occipital poles and the height as expressed by the collective tentorio-bregmatic, -perpendicular, -lambdal, and -occipital diameters in the three crania are as follows: Murut, L. 163 mm., H. 241 mm., = 404; Bajau, L. 151, H. 268 = 419; Botan, L. 161, H. 259 = 420. In the collective dimensions of length and height the Bajau and Botan crania are

almost equal to each other, and to the Múnda skull measured in Part iii. Table VI. of my series of Indian Memoirs. The corresponding dimensions in the Murut skull are distinctly smaller. The sections do not permit the breadth of the cranium to be given.

I have computed in the three crania the length of the three factors which make up the longitudinal circumference of the skull so that they may be compared with the corresponding dimensions of the skulls measured in my previous memoirs.

|  | Murut A. | Bajan M. | Botan |
|--|----------|----------|-------|
| Base line, . . . . .                               | 139      | 133      | 138   |
| Longitudinal arc, . . . . .                        | 369      | 361      | 360   |
| Longitudinal circumference, . . . . .              | 508      | 494      | 498   |
| Base line to longitudinal arc, . . . . .           | 2·6      | 2·7      | 2·6   |
| Base line to longitudinal circumference, . . . . . | 3·6      | 3·7      | 3·6   |

By the base line, a term employed by Professor CLELAND, is meant the length of the foramen magnum along with the basi-nasal diameter. It will be seen that the proportion of base line to the longitudinal arc or to the longitudinal circumference is almost the same in the three crania. They closely correspond with the proportions which I showed to exist in the Tamils, Pariahs, Veddahs, and Kham skulls described in Part iii. of my Memoirs on Indian Craniology.



## EXPLANATION OF PLATES I.-V.

The process blocks are reproduced from photographs of the skulls prepared by Messrs John Henderson and William Gill of the Anatomical Museum.

## PLATE I.

Fig. 1.—Murut, face view. Table I., A.

„ 2.—The Same, vertex view.

„ 3.—The Same, profile view.

Fig. 4.—Dusun, face view. Table I., H.

„ 5.—The Same, vertex view.

„ 6.—The Same, profile view.

## PLATE II.

Fig. 7.—Land Dyak, face view. Table II., O.

„ 8.—The Same, vertex view.

„ 9.—The Same, profile view.

Fig. 10.—Sea Dyak, face view. Table II., P.

„ 11.—The Same, vertex view.

„ 12.—The Same, profile view.

## PLATE III.

Fig. 13.—Bajau, face view. Table II., M.

„ 14.—The Same, vertex view.

„ 15.—The Same, profile view.

Fig. 16.—Kweejow, face view. Table I., L.

„ 17.—The Same, vertex view.

„ 18.—The Same, profile view.

## PLATE IV.

Fig. 19.—Botan of Formosa, face view. Table III., 1.

„ 20.—The Same, vertex view.

„ 21.—The Same, profile view.

Fig. 22.—Malay from Perak, face view. Table II., P.

„ 23.—The Same, vertex view.

„ 24.—The Same, profile view.

## PLATE V.

Fig. 25.—Tibetan, profile view. Table III., D.

„ 26.—Skull in Anatomical Museum. This and the Tibetan skull are figured to show the variation in the form of the occiput, due to the remarkable development of the Wormian bones.

Fig. 27.—Sagittal section through skull of Murut A

„ 28.— „ „ „ Bajau M.

„ 29.— „ „ „ Botan I.

In the sections the lettering is as follows :—

*b. al.* basi-alveolar radius.  
*b. n.* basi-nasal. „  
*b. g.* basi-glabellar „  
*b. br.* basi-bregmatic „  
*b. p.* basi-perpendicular „

*b. oc.* basi-occipital radius.  
*b. in.* basi-inial „  
*f. m.* plane of foramen magnum.  
*n. t.* nasio-tentorial plane.  
*n. br.* nasio-bregmatic chord.

SIR WILLIAM TURNER ON "Crania of Natives of Borneo, Malays, Formosa." PLATE I.



FIG. 1. Murut.



FIG. 4. Dusun.



FIG. 2. Murut.



FIG. 5. Dusun.

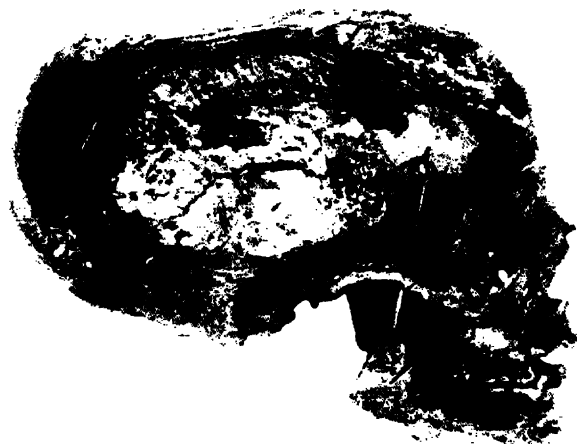


FIG. 3. Murut.



FIG. 6. Dusun.



SIR WILLIAM TURNER ON "Crania of Natives of Borneo, Malays, Formosa."—PLATE II.

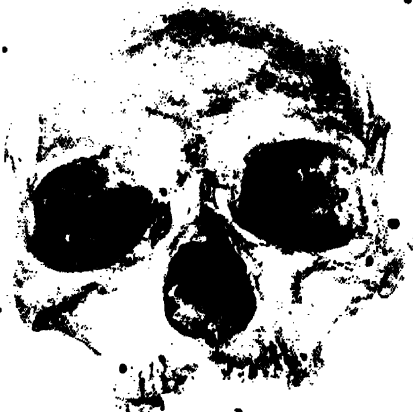


FIG. 7. — Land Dyak.



FIG. 10. — Sea Dyak.



FIG. 8. — Land Dyak.



FIG. 11. — Sea Dyak.

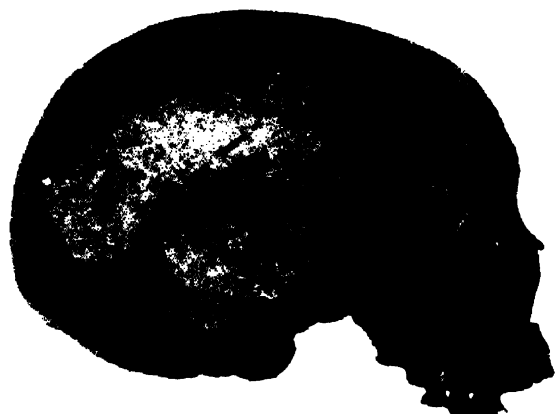


FIG. 9. — Land Dyak.



FIG. 12. — Sea Dyak.



SIR WILLIAM TURNER ON "Craniology of Natives of Borneo, Malays, Formosa."—PLATE III.



FIG. 13.—Bajau.

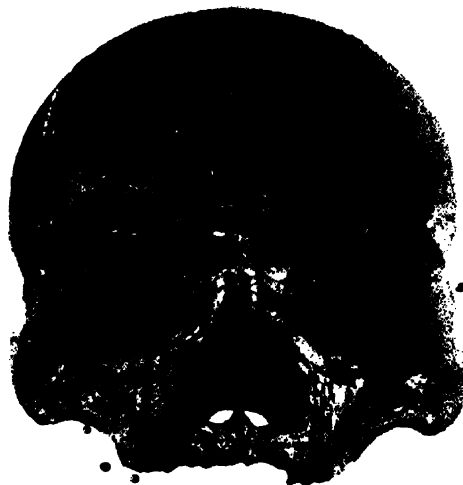


FIG. 16.—Kweejow.



FIG. 14.—Bajau.



FIG. 17.—Kweejow.



FIG. 15.—Bajau.



FIG. 18.—Kweejow.



SIR WILLIAM TURNER ON "Crania of Natives of Borneo, Malays, Formosa."—PLATE IV.



FIG. 19. — Formosa.



FIG. 22. — Malay.



FIG. 20. — Formosa.



FIG. 23. — Malay.



FIG. 21. — Fo



FIG. 24. — Malay.





SIR WILLIAM TURNER ON "Crania of Natives of Borneo, Malays, Formosa." PLATE V.

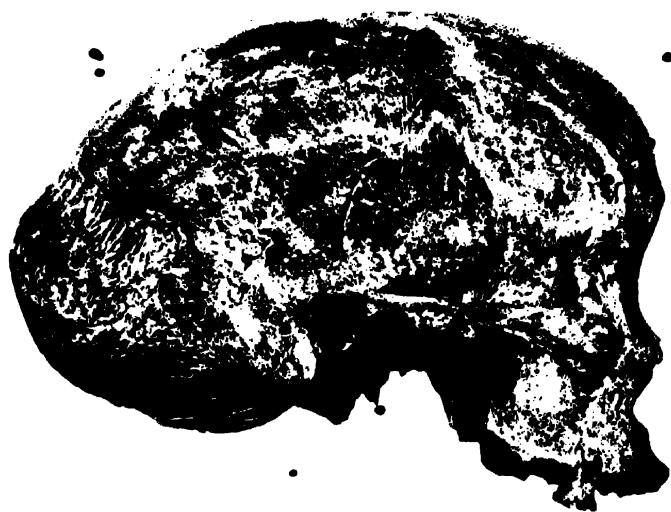


FIG. 25. Tibetan.

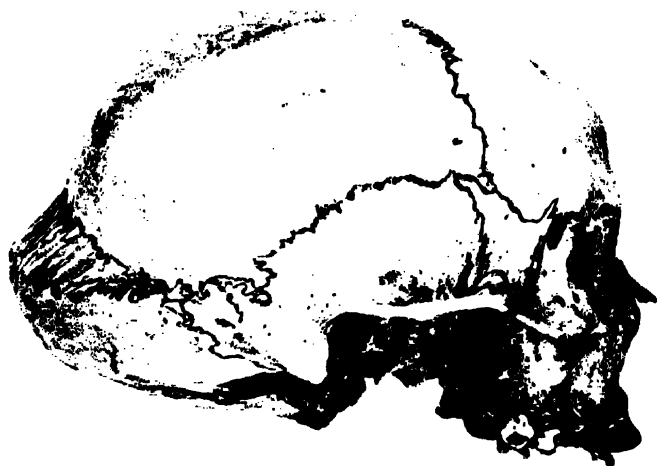


FIG. 26.

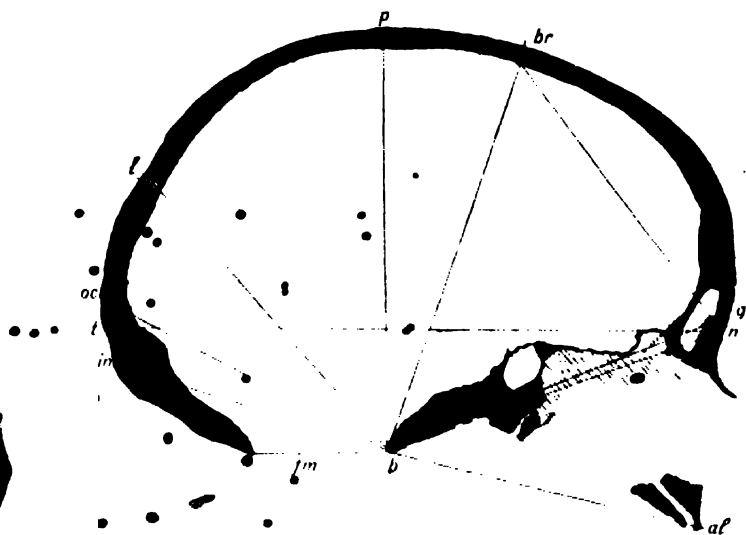


FIG. 27. Murut.

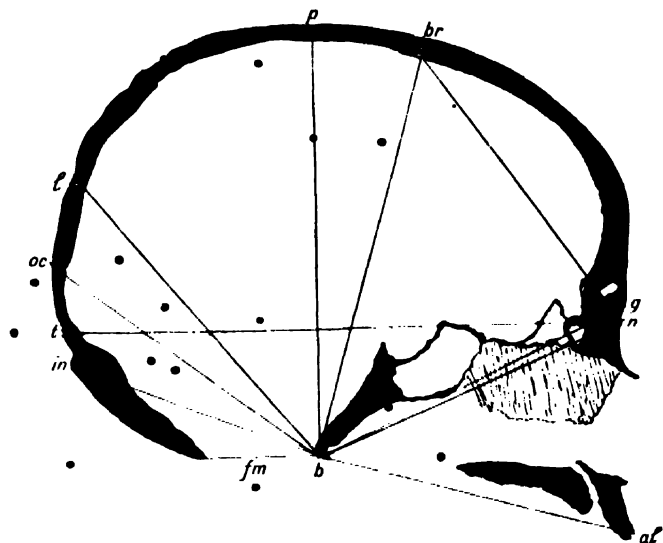


FIG. 28. Bajau.

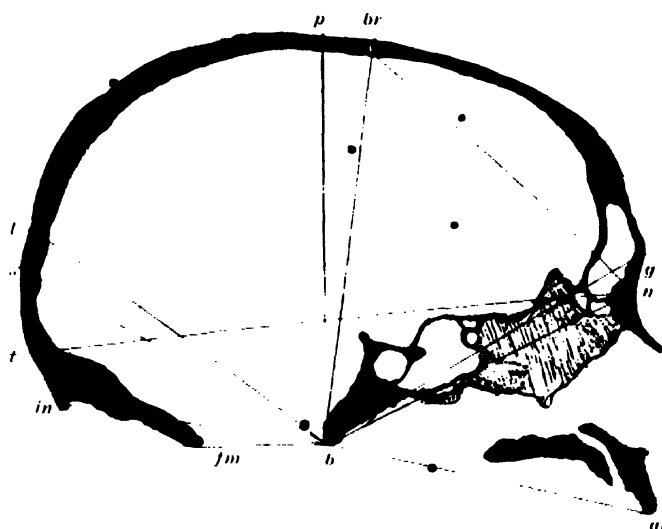


FIG. 29. Botan.



LIST OF PUBLISHED WRITINGS  
BY SIR WILLIAM TURNER,

K.C.B., F.R.S.L., P.R.S.E.

1854-1910



# LIST OF PUBLISHED WRITINGS BY SIR WILLIAM TURNER.

K.C.B., F.R.S.L., P.R.S.E.

1854-1910.

## I. HUMAN ANATOMY AND PHYSIOLOGY.

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